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Calculating the hidden variables

SOME MATHEMATICAL METHODS FOR INTELLIGENCE ANALYSIS

John G. Pierce

Advances in science and technology since World War II have significantly affected the intelligence profession. The benefits accruing from space technology, communications science, automation, microminiaturization, and many other technical disciplines are well known to intelligence professionals. Indeed, the reality of technical progress in intelligence has often outstripped the imaginations of science fiction writers and spy buffs alike.

A significant feature of this progress is the unequal distribution of its benefits among the several aspects of the intelligence process, namely, collection, processing, and analysis. Overwhelmingly, collection has been the largest beneficiary. Technical collection systems produce intelligence data in volume and quality once undreamed of. The legacy of three decades of increasingly sophisticated collection is a glut of data, difficult to store, and often impossible to analyze in depth.

Intelligence data processing (storage, retrieval, transmission, and dissemination) has lagged behind data collection by several years, more often for bureaucratic and budgetary reasons than for lack of adequate technology. Today's progress in automatic data processing, however, suggests that collection and processing will achieve a better balance in the foreseeable future.

The state of analysis is far less satisfactory. Despite substantial intelligence budgets, the processes of analysis and estimation have shown only poor and sporadic development. Some possible causes for this situation are: lack of quantitative orientation within the community; excessive concern with hardware and gadgetry, rather than with process and technique; preference for the judgment of the individual expert rather than the objectivity of scientific methodologies; and short-sighted budgeting, which stresses immediate results to the detriment of basic research.

Whatever the reason for the slow development of techniques of analysis, the following facts remain. There is no general theory of intelligence analysis. There is little analytical methodology to unify the empirical techniques currently used. There are few techniques for dealing with large and seemingly contradictory data bases. There are only a few methods for gaining access to hidden variables, or for treating problems which defy the sequential logic of normal human reasoning.

Recognition of these deficiencies is increasing. In their annual statement [1] of high-priority research and development needs within the Department of Defense, the Joint Chiefs of Staff (JCS) note: "There is a huge imbalance between the large investment in collection and acquisition systems, and the relatively minor R and D efforts to upgrade analytical techniques and methodologies."

[1] "Joint Research and Development Objectives Document for FY 1977 through FY 1994," Section XI, 23 Jan 1975 (SECRET).

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Regarding specific areas of military intelligence, the JCS add: "The lack of suitable analysis techniques for warfare system assessment represents a critical deficiency in meeting technical intelligence requirements."

The JCS then conclude: "Firm support of this effort [to overcome the lack of analysis techniques] is immediately required, not only to optimize R and D expenditures in other areas, but most importantly, to improve the quality of intelligence support to national-level decision makers."

In anticipation of these issues, the author and several colleagues at the Center for Naval Analyses (CNA) have been conducting basic research in intelligence analysis.[2] Useful techniques have been developed and successfully applied to naval problems. It became apparent that the approach and the techniques had much wider applicability than originally expected. Sufficient progress now has been made to warrant presentation of some results. Although still far short of a comprehensive theory of intelligence analysis, our approach is sufficiently broad to point to the solution of an interesting class of intelligence problems.

It is significant that the approach we developed involved nothing fundamentally new. Rather, it involved a merger of elements from four mature professions: electrical engineering, operations research, computer science, and intelligence. Of greatest difficulty was the acquisition of a sufficiently broad perspective of each profession to effect a successful merger. Compartmentation—of academic knowledge as well as of intelligence information—was a constant impediment.

Electrical Engineering

One fundamental insight to our approach, evident in retrospect but not during the development process, is of such importance that it will serve as the basic postulate underlying all our methodology:

> Much intelligence analysis is formally equivalent to a central problem in electrical engineering: The detection of a signal and the estimation of its characteristics in the presence of noise, both natural and man-made.

Electrical engineers, particularly those specializing in communication theory, have produced much literature [3] on detection and estimation theory, encompassing several very powerful mathematical techniques. Our task has been to adapt these techniques to intelligence problems.

If the intelligence to be analyzed is in fact a "signal" interpreted in a strict engineering sense, our basic postulate is a truism, and adds nothing to our understanding of the intelligence problem. "Signal," however, can be much more broadly interpreted, to comprise nearly every act capable of conveying meaning or intent. The repainting of a warship, a fresh dab of a perfume, and a fist on the nose are all "signals," subject to detection and to evaluation in the light of past experience. But to suggest that all such diverse examples of a signal can be analyzed by engineering methods is clearly an overstatement. The limits of such analysis, then, need to be defined.

[2] The basic concepts reported in this paper were developed by the author. Mathematical refinements and extensions of the theory, as well as validation of the model, were made by Dr. R. L. Hubbard and Dr. L. S. Straus of CNA. Data collection and processing were conducted by Cdr. R. J. Wilson, USN.

[3] The literature is well represented by H. L. Van Trees' three-volume *Detection, Estimation, and Modulation Theory*, (John Wiley and Sons, Inc., New York, Part I, 1968, Part II, 1971, Part III, 1971).

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Signal detection is a statistical procedure. To adapt engineering methods to detection and analysis of more generalized signals, those signals must conform to some basic properties of statistical quantities.

- Signals must be quantitative rather than qualitative.
- Both the signals and the interfering noise must be describable in terms of probability distributions.

These requirements rule out the most extreme examples of generalized signals; yet, they are not overly restrictive. Many items of high intelligence interest are quantitative. (A binary choice, such as the occurrence or nonoccurrence of an event, is quantitative in this sense.) Moreover, many of the relevant signals can be considered to be described by a probability distribution, based on either empirical evidence or prudent assumptions.

Ingenuity and a thorough knowledge of engineering techniques are the essential bases for developing a proper statistical description, and for selecting appropriate detection and estimation procedures for each intelligence problem.

Operations Research

Even the most powerful electrical engineering techniques are useless when the object of interest to the intelligence community is not observable. Hidden variables, i.e., those which do not directly produce a signal, are inaccessible to signal estimation methods alone. The contribution of operations research has been to provide a quantitative, logical linkage between the hidden variables of high intelligence value, and the signals that can be observed by intelligence collectors and analyzed by engineering methods.

Operations research is stressed here because it has been the most useful discipline in solving naval operational intelligence problems. Other disciplines will serve as well in their special areas of application. Economics comes immediately to mind as an area ripe for exploitation.

Regardless of the specific discipline involved, the vital element is a mathematical model which provides a relationship between hidden variables and observables (signals). The mathematical models can take many forms, and we have yet to define the precise limits for an acceptable model. In mathematical terms, models may be explicit or implicit, functional or parametric, deterministic or probabilistic. It is important to note that useful models are not restricted to deterministic, single-valued functions.

A usable mathematical model should minimally provide the following:

- A chain of logic between the hidden variable and the observable, such that, if all other factors are constant, a change in the hidden variable implies at least a probability of change in the observable.
- A complete description of the other factors that can influence the observable, such that their effects can be identified and taken into account.
- Sufficient generality, such that the model can be verified in benign circumstances and then applied with confidence in foreign intelligence situations.

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Applications of this approach in the hard sciences are standard. For example, it is not unexpected that inferences about nuclear weapon design can be made from examination of nuclear debris, because precise and accepted laws of physics are involved. These provide, in our terminology, "the chain of logic between the hidden variable and the observable." The major advance in our research has been the demonstration that valuable results can be obtained with models far less precise than those used by physicists. The soft sciences have as much promise, and far wider applicability in intelligence, than the more rigorous physical sciences.

Computer Science

The obvious contribution of computer science is the modern digital computer. Computers are necessary for two reasons. First, computers can store and manipulate large data bases dispassionately, and in so doing, circumvent the human tendency to emphasize the most recent or the most striking pieces of information. Because the computer can apply more data to a problem than the most expert individual can, computer-produced estimates are less subject to the biases of small, selective data samples. Second, computers can perform extensive and complex calculations that are totally impractical by manual methods. We have found it necessary to use computer-aided, trial-and-error solutions to problems that have no direct, analytical solution. Although not a sophisticated technique, this does require much computation that could be accomplished in no other way.

Intelligence

The intelligence profession is both the supplier of data for which our techniques are designed, and the initial consumer of the results. With regard to the data, two points clearly illustrate the strong interaction of the intelligence profession with the other professions discussed above.

The engineering methods we have mentioned are statistical procedures. In general, the accuracy of statistical methods increases as the size of the data sample is increased. Thus, the coupling of the statistical estimation techniques with the power of the digital computer places intelligence data in a new perspective. The glut of data produced by technical collection systems is transformed from a burden to an asset. Each item of data that would only overwhelm a human analyst now contributes incrementally to the accuracy of the result. In our exploratory work, human screening and manipulation of data has been necessary prior to computer processing. In other circumstances, however, it should be possible for data to pass directly from collection systems to an automated analysis system, with minimal human intervention.

Mathematical models, by emphasizing logic and completeness, provide an invaluable guide for intelligence collection. First, through the linkage between hidden variables and observables, models demonstrate what is feasible. If, for example, an accessible, but otherwise useless, observable can be linked to a desired hidden variable, then a program to collect that observable can be justified. More important, the completeness of models stresses the peripheral data to be gathered in addition to the principal observable. Especially in cases where peripheral factors affect the relationship between hidden variables and observables, all relevant data must be collected. This often involves only marginal extra effort, but it can redeem an otherwise lost program.

In sum, the contributions of all four professions must be emphasized. In every example developed to date, each of the four elements has been indispensable: a formal estimation technique from electrical engineering; a mathematical model from operations research; the use of a digital computer; and an intelligence data base. Although the first two elements are emphasized in this paper, because of their primary methodological interest, they can function effectively only in conjunction with the other two elements.

The elements of the method have been discussed without reference to procedures because no procedures apply universally. Each problem is different, and unique procedures must be developed for each solution. However, the four elements constitute the building blocks from which specific solutions may be fabricated. Below is a detailed description of one such solution to illustrate both the general philosophy of our problem-solving approach and one specific set of analytical procedures.

AN EXAMPLE

The capabilities of the passive sonar systems of enemy submarines are clearly matters of high intelligence interest, yet these are among the most difficult items to determine by traditional intelligence methods. In the absence of explicit performance data from defectors or agents, the analyst has little with which to work. It is necessary to rely largely on extrapolation from U.S. sonar performance data, guided by submarine size and shape, dimensions of observed sonar arrays, and a general knowledge of the enemy's acoustic technology. Estimates made in this manner are tenuous at best.

More important, such estimates aim at "best case" technical design performance. They provide no insight into operational performance under realistic field conditions. Experience with U.S. systems has amply demonstrated that operational performance is often significantly poorer than design specification, and there is little reason to believe that other nations are more fortunate in this regard. Thus, our traditional intelligence methods may substantially overestimate the operational capabilities of potential enemies.

The methods described in this paper were developed to deal with the passive sonar problem. Although other applications now are obvious, this original problem still provides the best vehicle for illustrating the principles.

It is impossible to describe our methods without some technical detail. The full development of the mathematical reasoning is presented in the annex to this paper. This section of the main text will stress the basic ideas which underly the mathematical arguments. Even in the annex, however, many technical points are simplified in the interest of clearer exposition. Details on the sonar equation can be found in any standard text on underwater sound. Details on the Maximum Likelihood Estimation (MLE) technique are similarly reported elsewhere.[4]

The basic purpose of a passive sonar is to determine the presence, identity, and movements of ships and submarines at sea. This is accomplished by intercepting and interpreting part of the sound produced by the target as it moves through the water. Several steps are involved in this process. First, the target produces a sound, whose intensity and frequency spectrum are characteristic of the target type. As the sound travels through the water, its intensity diminishes, and various types of distortion are introduced. Interfering noise is added. The sonar receives a mixture of the original

[4] Center for Naval Analyses, Research Contribution 273, *Use of Maximum Likelihood Estimation to Evaluate Passive Sonar Performance,* L. S. Straus, R. L. Hubbard, and J. G. Pierce, Nov. 1974 (CONFIDENTIAL).

sound and the added noise, and processes the mixture. Finally, the results are visually or aurally presented to a human operator, who must decide whether a target is present and what the target is.

The preceding discussion is summarized by the sonar equation, the basic analytical tool of undersea warfare:

(1) SE = SL − PL − AN + DI - RD

where SE = signal excess at the receiving sonar;
SL = source level of the target;
PL = propagation loss in the water between source and receiver;
AN = combined noise, including ambient background and receiver self-noise;
DI = directivity index of the receiving sonar; and
RD = recognition differential of the receiving sonar and operator.

Each of the terms of equation (1) is measured in decibels relative to an agreed reference.

For our discussion, two features of the sonar equation are important. First, the terms of the right-hand side of equation 1 are conveniently separated into three categories, dealing, respectively, with the source, the intervening acoustic path, and the receiving sonar. In a typical intelligence application, the terms associated with the source (SL) and with the acoustic medium (PL and AN) can be estimated from available data, or are measurable on scene. DI and RD are uniquely associated with the enemy passive sonar, and are unknown. DI refers to the enhancement of the incoming sound due to the arrangement of receiving elements located within the sonar, while RD refers to both the electronic processing within the sonar system and the interaction of the human observer with the sonar system output displays. Although these terms separately represent distinct concepts, they always appear in the sonar equation in the combination DI − RD. Thus, in practice, a single quantity,

(2) X = DI − RD,

characterizes the performance of the sonar and operator system. It is this quantity, X, that we wish to determine.

Second, each term of the sonar equation (equation 1) depends in a unique way on the frequency of the acoustic signal, f. The frequency dependence of SL, PL, and AN can be determined empirically. However, the functional dependence of X on f, representing the design characteristics of the enemy sonar, is not known. More important, the actual design/operating frequency, f_0, of the sonar is usually also unknown.

The quantities X of equation 2 and f_0 are the hidden variables of the problem. They are of high intelligence value, yet are not directly observable. The initial steps in solving the problem are (a) to find a relevant set of observables, and (b) to establish a mathematical model relating those observables to X and f_0.

To describe the solution as a sequence of well-ordered steps is perhaps an oversimplification. In reality, when neither the proper observables nor the proper model are known, the mental process is more vague and less systematic, truly more art than science. Nonetheless, we may inquire into what observations regarding enemy submarines could be related to the performance and listening frequency of their passive sonars.

From time to time, submarines of different nations encounter each other in the high seas. Recognition of such an encounter is normally made by passive sonar. The paramount concern of the commanding officer in peacetime is the safety of his submarine. When he detects another submarine on passive sonar, he is faced with a dilemma. Because passive sonar does not provide an immediate and reliable estimate of distance, he must either maneuver to avoid a possible collision, or attempt to determine the range to the other submarine. The latter also normally involves maneuvers. If the other submarine has detected him first, his maneuvering telegraphs his counterdetection, and provides the needed clue to his sonar capability.

It may be that due to operational security, the commander chooses not to expose himself by maneuvering. However, as we discuss below, this is inconsequential. Statistical estimation methods can completely circumvent individual attempts at deception.

Fortunately, U.S. passive sonar technology is at present superior to that of any other nation. In an encounter, a U.S. submarine could therefore expect to make the first detection, and then observe the reactions of the foreign submarine. In an extended series of encounters, two groups of events would emerge: one in which obvious reactions by the foreign submarine imply definite counterdetection, and one in which no obvious reactions or ambiguous actions imply either no counterdetection or deliberate deception. This, then, would constitute the signal required by our model.

This signal (the sequence of apparent detection and nondetection events) must be then related to the hidden variables of the enemy sonar, X and f_0. Part of this process has already been accomplished in the sonar equation. Equation 1 expresses the signal excess as an explicit function of X; the functional dependence on f is implicit through the other frequency-dependent terms.

The mathematically inclined reader now may skip to the annex to follow the detailed derivations. A parallel, but qualitative, development of the principal ideas is presented below.

The quantities represented in equation 1 are called stochastic variables. This means that they are subject to statistical fluctuations; they are not, however, totally unpredictable. In a particular encounter between submarines, each term in equation 1 is the sum of its average value, plus a deviation drawn from a statistical ensemble. With respect to source level, for example, the average value is the estimated source level, the quantity measured for, and normally ascribed to a particular target under the specified circumstances. The deviation from the mean accounts for such factors as inaccurate measurement, unsuspected departures from nominal circumstances, and unmeasurable effects.

It is assumed that the source level deviation term, because it is a random quantity, can be adequately described by a mathematical function—its probability distribution. That function must possess certain minimum mathematical properties, such as a finite variance. It is significant, however, that the detailed shape of the function does not need to be known.

Similar assumptions are then made about the other terms of equation 1: that each consists of an average plus a deviation; that each deviation can be described by a probability distribution with finite variance; and that the form of the distribution need not be known.

A very important statistical principle known as the Central Limit Theorem is then invoked. That theorem states that, under appropriate circumstances, the sum of several stochastic variables will conform approximately to a Gaussian probability distribution, even if the component variables do not. The Gaussian (normal) distribution is the familiar "bell-shaped curve," whose mathematical properties are well known, and whose precise shape depends on only two parameters: the overall average, and the overall variance.

This step is vital, because it provides the initial key to solution. It establishes one of the necessary relations between the known and unknown components of the total signal excess.

The signal excess provided by the sonar equation must then be related to the observation of detection or nondetection. This is accomplished through a simple, but commonly used, detection model. Detection is assumed to occur when the true signal excess is positive; conversely, detection will not occur when the signal excess is negative. This assumption can easily be expressed in mathematical language.

In real submarine encounters, two types of events are considered. In each case, an event starts when a great distance initially separates the two submarines, and no possibility of mutual detection exists. The two submarines then close to some minimum range, called the closest point of approach (CPA), and subsequently increase range until the event terminates. We assume in all cases that the U.S. submarine makes the first detection, and has time for adequate maneuvering to determine effectively the range to the other submarine. The alternatives for the enemy submarine are a counterdetection of the U.S. submarine at some range greater than CPA, or passage through minimum range without any counterdetection.

The probability of occurrence of each of these events can be expressed in precise mathematical form, using only the assumed detection model, and the Gaussian form for the deviation of the signal excess. The results are presented as equations 13 and 15 in the annex. Those two equations are the mathematical model of our problem, i.e., the logical linkage between the hidden variables and the observables. They constitute the contribution of operations research.

Several points are important in recapitulating the model. First, the probabilistic nature of the model must be stressed. The equations developed in the annex relate the hidden variables to the probabilities of observed events. The hidden variables are not causal. A change in the hidden variables does not guarantee a change in the observables, but only in their probability of occurrence. It is a strength of statistical methods that a deterministic model is not needed. Access to the hidden variables can be gained through the laws of probability alone.

The model's completeness and its implications for intelligence collection must also be stressed. We have emphasized the occurrence or nonoccurrence of a counterdetection as the principal observable related to X and f_0. Inspection of the model equations shows that they contain other variables as well. These other variables give the clue to the data which need to be recorded in a submarine encounter, beyond the mere observation of the enemy's reaction. The discussion in the annex provides a complete list of those extra data items, whose absence would render our methods useless.

The model's universality and its relevance to intelligence must also be emphasized. The model has been employed widely by many nations in the analysis of undersea warfare. It contains only elements which can be empirically verified and which are accepted by naval analysts. It is, of course, approximate, but it is generally applicable. Futhermore, none of the elements is so specialized that the model would be expected to fail in actual intelligence operations. The sole difference between the model as we employ it and its conventional employment is the reversal of the roles of the known and unknown variables. In conventional applications, the terms of the sonar equation are known, and the probability of detection is to be calculated; here, certain unknown terms of the sonar equation are computed from known detection performance.

Selection of an estimation technique is the final step, representing the unique contribution of electrical engineering methods. Van Trees [5] thoroughly discusses the available estimation techniques. The technique which satisfies the various technical requirements of our present problem, and which we have found most flexible and useful, is called Maximum Likelihood Estimation (MLE).

The core of the MLE technique is the likelihood function. This is a mathematical function that expresses the probability (or likelihood) of a particular set of observations, given the assumption that the factors contributing to the outcome have specified values. Depending on the values assumed for the contributing factors, the value of the likelihood function may be large or small, corresponding to highly likely or extremely remote outcomes, respectively. The MLE method finds the set of values for the contributing factors which produces the maximum value of the likelihood function. Such values are assumed to provide the most plausible explanation for the observed events.

The observed events in our problem are the submarine encounters, resulting in either counterdetection or no counterdetection of the U.S. submarine by the enemy. (We defer temporarily the issue of deception.) Equations 13 and 15 of the annex provide the probabilities of outcome for individual events. We consider as a basic data set only events that can be considered to be independent (isolated in space or time). They are then treated as statistically independent events.[6] Therefore, the likelihood function for the whole set is simply the product of probabilities for the individual events.

Using the product formula, and the pertinent mathematical forms for the individual event probabilities, we can express the likelihood as a function of the hidden variables X and f. The location of the maximum of the likelihood function is determined by computer search. This is initiated by making reasonable guesses for X and f_0 and by calculating the likelihood function. The inputs are then systematically varied around the initial guesses until the largest value of the likelihood function is established. Clever guessing can reduce the computation time, but cannot eliminate the dependence on a computer for the success of this method.

The desired estimates of the original hidden variables, X and f_0 are obtained by inspecting the computer printout. Apart from the issue of deception, the problem is solved.

Because of its extreme importance, the issue of deception has been reserved for the end of our discussion. Deception enters our problem in an asymmetrical fashion. Even though the enemy commander may make a counterdetection, he can pretend otherwise; when he has not made a counterdetection, however, he cannot pretend that he has. Thus, all perceived counterdetections by the U.S. submarine are correct, while some of the perceived noncounterdetections may be false. This can be incorporated

[5] *op. cit.*, Part I, p. 52 *et seq.*

[6] This assumption is not always satisfied, and further research is needed on the implication of relaxing this assumption.

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into our model as follows. Define an overtness factor, β, $(0 \leq \beta \leq 1)$, as the fraction of true counterdetections that are correctly perceived by the U.S. submarine. $\beta=1$ represents no effective deception; $\beta=0$ represents complete deception.

The overtness factor can be incorporated into the likelihood function by making appropriate changes in the formulas. Such changes appear superficially to be little more than mathematical manipulation, until we recognize that β itself can also be estimated by the same MLE techniques used for the other parameters.[7] That is, the overtness factor qualifies as a proper hidden variable of the problem, comparable to X and f. This fact has the most profound implications for intelligence analysis. *The existence and frequency of enemy deception can be accurately determined by statistical estimation techniques.* Moreover, existence of deception does not substantially impair our ability to estimate the other quantities of interest.

The reason for this lies in a subtle difference in the probability structure of attempted deception. In the events not involving deception, the probabilities of various outcomes are governed by the mathematical model we have described in this paper. That model incorporates laws of physics, human behavior, and probability to impose a unique statistical structure on a large set of events. When an enemy submarine commander has to decide whether or not to deceive, he is unaware of how he fits into this statistical structure. He must make a decision, possibly based on set rules, but still largely independent of what others have done in comparable circumstances. In making his decision, he responds to imperatives different than those in the detection problem, and thereby builds a distinct statistical structure around the events involving deception. If the statistical structures in the two cases are sufficiently different, and the sample of events is sufficiently large, they can be distinguished by our estimation methods.

It should be noted that all aspects of these techniques have been thoroughly validated, first with contrived data, and then with data from U.S. submarine exercises.[8] The estimates have been highly reliable in recovering known input values, including those of the overtness parameter, β. Further validation has come from a different but equally useful application of the methodology.[9] MLE techniques have been used to monitor the continuing operational performance of U.S. acoustic surveillance systems. In this application, the problem is to check the acoustic parameters of systems that are physically inaccessible to direct measurement. $X=DI-RD$ is calculated by MLE techniques and compared with engineering measurements made prior to emplacement. Agreement between the two values serves both to validate the MLE approach, and to indicate that the system performance is not deteriorating *in situ*.

IMPLICATIONS

Important to the theme of the paper is that our methods constitute a general philosophy for approaching problems, not a rigid prescription for solving them. Solutions to other intelligence problems have been constructed which were totally dissimilar to the sonar problem. Yet the same four basic elements were relevant: a formal estimation technique, a mathematical model relating observable data to hidden variables, computer processing, and an intelligence data base.

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[7] Recognition of this vital fact is due to Dr. R. L. Hubbard.

[8] Center for Naval Analyses, Memorandum (CNA)1510-74, *Estimation of Operational Performance of U.S. Submarine Passive Sonars for Selected Fleet Exercises*, L. S. Straus, 19 Sep 1974 (Secret).

[9] Center for Naval Analyses, Memorandum (CNA) 0049-75, *Evaluation of SOSUS Performance During the Transit Exercise Northern Merger* (*September 1974*, L. S. Straus) 9 Apr 1975 (Secret).

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Because the prescription is flexible, the possibilities for application are enormous. The greatest latitude lies in the mathematical model. Both the subject matter and the mathematical form of the model are free, and can be tailored to the individual problem. Models from economics and the social sciences may have as much potential as those from operations research and the physical sciences.

Desipite their substantial promise, our methods do not offer a means of solving all intelligence problems. The methods have significant limitations, as is discussed below.

Limitations

First, our methods are not predictive, and are designed to obtain estimates solely about existing situations. Moreover, there is an implicit assumption that the situations remain statistically unchanged throughout the entire period covered by the analyzed data. Hence, the methods we have developed thus far have little relevance to the indications and warning (I&W) problems that occupy so much attention in the intelligence community. There is no reason why analogous mathematical methods could not be applied when future actions are the primary concern. Predictive techniques are currently employed in many engineering applications, and the author has conjectured that some of these could be readily adapted for use in I&W, although this conjecture remains unproven.

Second, our techniques require large data bases and relatively complicated processing. They must therefore be carefully planned and set up prior to application, and cannot be quickly adapted to changing circumstances. When time is short and data sparse, these methods are not competitive with the more traditional human estimation techniques.

Third, these methods are restricted to circumstances where a quantitative model applies, and, more important, where the practitioners of the trade agree that it applies. Although there may be disagreement over the precision of a particular model, if the applicability of the model is doubted, then sophisticated mathematical processing can claim no special legitimacy. Conventional estimation methods would be preferable. In the example given in this paper, we took care both to use standard, accepted models, and to subject our results to *post facto* validation. In any future applications, both of these features would be desirable; in situations where empirical validation is not feasible, then prior agreement on the applicability of the model would be mandatory.

Fourth, these techniques can be circumvented by sufficiently sophisticated countermeasures. The countermeasures must be statistically subtle, and must rely in part on specific knowledge of the technique to be countered. In this sense, the interplay of measure and countermeasure resembles the interplay between the makers and breakers of codes.

Even when a theoretically correct countermeasure is devised, it may be costly and impractical to implement. The reader may wish to elicit the proper countermeasure to the technique described in this paper, and to develop a practical set of procedures through which an enemy might implement it.

Such as experiment will reveal that effective countermeasures require careful design, extensive coordination, and (sometimes) costly hardware, even with full knowledge of the specific methods to be countered. In the real world, the difficulties of anticipating a variety of vulnerabilities and of imposing adequate countermeasures against each are so great that the advantage remains with the seeker of intelligence. Indeed, our methods are able to distinguish and circumvent simple but practical

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enemy deception tactics with considerable ease. Not all the implications of this important discovery have yet been examined; further research is clearly needed.

Implications for Deception

As long as the advantage falls to the seeker of intelligence, adverse security implications exist. What we can learn about the enemy, he can learn about us by similar methods. Our own cover and deception operations must be thoroughly reviewed for statistical vulnerabilities. It has long been assumed in military planning that random operations are sufficient to confuse an enemy and deny him military intelligence. It now is recognized that there are innumerable types of random operations, each governed by a unique probability distribution. If the distributions are sufficiently different, and if the amount of data is adequate, then deceptive actions can be separated from valid operations, and valuable intelligence about the latter can be determined.

Large-scale efforts, involving many people and extending over much time, are most vulnerable to statistical unmasking. In such situations, there is time for the enemy to gather and analyze much data, and there is ample opportunity for friendly forces to deviate from a controlled deception plan. Attempts to cover preparations for a major attack, or to disguise true military or economic capabilities in peacetime, exemplify significant vulnerabilities. For other types of operations, considerable security remains. A single isolated event cannot be identified as valid or false by statistical analysis. In addition, a considerable body of data must be assembled and subjected to complex processing before deception is apparent. Thus, unique and time-sensitive deception operations, such as brief military feints, would be immune from exposure by statistical methods.

Implications for the Management of Intelligence

We now should consider the implications of our experience for the intelligence manager. If work of the type described in this paper is to be pursued, its organization, the type of people involved, and personnel training must be considered. Our consulting practice for the U.S. Navy has given us general experience from which to address these considerations, as has what we learned while working specifically on intelligence methodology.

The most important point is that successful methods of analysis are not developed in isolation. Rather, they come from an intimate and continuing contact with the practical day-to-day problems confronting intelligence producers.

A degree of detachment is necessary, however, in that development of methodology must be immune to the pressures and deadlines of intelligence production. Developers must be free to question existing methods, to cut across organizational boundaries, and to adopt the broader viewpoints of top management. We have found that the greatest impediment to the development of new methods is the over-specialization of analysts. Breadth of knowledge, more than depth, is a key factor.

The contradictory requirements of intimacy and detachment can be partly reconciled by vesting responsibility for the development of new methodology in a small staff group, independent of existing production-oriented organizations. Specific management provisions should shape the character of the group, and govern its

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relations with other elements of the intelligence community. The most important management provisions are these:

- The group should be strictly limited in size to ensure flexibility and free internal communications. A maximum of 30 professionals is recommended.
- The group should report directly to a senior manager. This would provide the needed access to management thinking and the authority for the implementation of successful developments.
- The group must have unfettered access to intelligence data and to information on collection techniques.
- The group should be designed to facilitate close working relationships with the analysts involved in intelligence production. Contact with production organizations at only the management level is inadequate.
- Most important, the group should have no line responsibilities, and should produce no finished intelligence. When a new method is successfully developed and tested, it should be turned over to another group for implementation.

The selection of members of such a group is as important as the management provisions governing the group. The latter should contain a mixture of scientists and intelligence professionals with broad, varied skills. Our experience suggests that a ratio of three scientists to one intelligence professional would be a productive mix. Regular rotation of staff members is effective in balancing theoretical and practical skills. This should include both the infusion of new intelligence analysts from active production jobs, and the temporary loan of staff scientists to production organizations.

Specific qualities of individuals of the group should include:

- Appreciation of the demand for, and value of, specific intelligence products.
- Familiarity with all existing data bearing on the problems under consideration.
- Knowledge of the capabilities of existing collection systems.
- Broad technical knowledge in the appropriate disciplines.
- Considerable skill and flexibility in contriving mathematical models and in puzzle solving.

These requirements run contrary to the traditional emphasis on compartmentation within the intelligence community, and on specialization within the educational system. Nonetheless, if mathematical intelligence methods are to be implemented, breadth of both knowledge and information must be ensured.

SUMMARY

Contentions were made throughout this paper to justify and explain our methodology and its implications. To recapitulate, these are that:

- A significant part of intelligence analysis is equivalent to the "signal in noise" problem, long familiar to electrical engineers.
- Certain intelligence problems can be quantified through the use of mathematical models.

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- The rigorous logic of a mathematical model provides a complete and accurate guide for intelligence collection.
- Large data bases are not a burden, but an asset and often a necessity.
- Use of a large computer is often necessary to complete the analytical solution.
- Enemy deceptive operations are potentially distinguishable.
- An enemy could use mathematical intelligence techniques against us, necessitating that we reexamine our own vulnerabilities.
- Effective development of intelligence analysis methodology requires special management provisions.

Around these contentions, we have developed a philosophy for approaching a certain class of intelligence problems, and have demonstrated a solution to one specific problem. The resulting methods appear worthy of incorporating in the standard array of intelligence analysis techniques. Most important, we have uncovered a significant research area, and have demonstrated that systematic investment in methodological research can yield handsome dividends.

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ANNEX

Given the sonar equation in the foregoing text,

(1) SE = SL − PL − AN + DI − RD

where SE = signal excess at the receiving sonar;
SL = source level of the target;
PL = propagation loss in the water between source and receiver;
AN = combined noise, including ambient background and receiver self-noise;
DI = directivity index of the receiving sonar; and
RD = recognition differential of the receiving sonar and operator.

and the statement

(2) X = DI − RD to characterize the performance of the sonar and operator system, let S represent the combination of known (or measurable) terms:

(3) S = SL − PL − AN.

Then, equation 1 can be rewritten as

(4) SE =S(f) + X,

where the functional dependence of S on frequency is emphasized by the notation.

The quantities represented in equations 1 and 4 are stochastic variables, subject to statistical fluctuations but not totally unpredictable. In a particular encounter between submarines, each term in equation 1 is the sum of its measured (or estimated) values, plus a deviation drawn from a statistical ensemble. For example, the true, but unknown, source level may be represented as:

(5) $SL = \overline{SL} + \delta_{SL}$.

$\overline{SL}$ is the estimated source level, the quantity measured for and normally ascribed to a particular target under the specified circumstances. δ_{SL} is the deviation from the mean for such reasons as inaccurate measurement, unsuspected departures from nominal circumstances, and unmeasurable effects.

The probability distribution of δ_{SL} is assumed to have a standard deviation, σ_{SL}. The form of the distribution need not be specified. With similar assumptions about the other terms, equation (1) can be rewritten as:

(6) $SE = \overline{SE} + \sigma_{SL}$, where

(7) $\overline{SE} = \bar{S} + \bar{X}$, and

(8) $\sigma\xi = \delta_S + \delta_X$.

The standard deviation of the signal excess from all causes, δ, is related to the component standard deviations by:

(9) $\sigma^2 = \sigma^2_{SL} + \sigma^2_{PL} + \sigma^2_{AN} + \sigma^2_{DI} + \sigma^2_{RD} = \sigma^2_S + \sigma^2_X$.

$\bar{S}$ may be computed from its constituent terms; $\bar{X}$ is the average value of the unknowns associated with the enemy sonar; and ξ contains the deviations caused by all sources. Unlike it constituents, ξ is assumed to have a Gaussian (normal) probability distribution, with zero mean and standard deviation of unity. This assumption is based on a statistical principle called the Central Limit Theorem which states that under certain circumstances, the sum of several stochastic variables will conform approximately to a Gaussian distribution, even if its components do not.

The signal excess provided by the sonar equation then must be related to the observation of detection or nondetection. This is accomplished through a simple, but commonly used detection model. Detection is assumed to occur when the true signal excess is positive; conversely, detection will not occur when the signal excess is negative. The mathematical expression of these assumptions is:

(10) $$P_d = \begin{cases} 1 \text{ when } SE > 0 \\ 0 \text{ when } SE \leq 0. \end{cases}$$

In real submarine encounters, two types of events are considered. In each case, an event starts when a great distance initially separates the two submarines, and no possibility of mutual detection exists. The two submarines then close to some minimum range, called the closest point of approach (CPA), and subsequently increase range until the event terminates. We assume in all cases that the U.S. submarine makes the first detection, and has time for adequate maneuvering to determine effectively the range to the other submarine. The alternatives for the enemy submarine are a counterdetection of the U.S. submarine at some range ($r \geq$ CPA), or passage through minimum range without any counterdetection.

In a series of such encounters, the probability that the ith. encounter will occur without counterdetection is equal, by the assumed detection model, to the probability that the signal excess is negative throughout the passage. That is, if SE_i is the maximum value of SE during the ith event:

(11) $$P_n = Pr(SE_i \leq 0) = Pr(S_i(f) + \bar{X} + \xi\sigma \leq 0)$$

From the assumption that ξ is normally distributed about zero, this can be rewritten as:

(12) $$P_n = 1 - \frac{1}{\sqrt{2\pi}} \int_{\infty}^{(\bar{S}_i(f) + \bar{x})\sigma} \exp(-\xi^2/2) d\xi.$$

For simplicity, this is denoted as:

(13) $$P_n = 1 - \phi_i(\bar{S}_{i(f)}, \bar{x}, \sigma);$$

Φ_i, defined in this way, is a standard tabulated mathematical function, commonly used in statistics.

The probability that, during the jth encounter, a counterdetection occurs when the signal excess is between SE_j and $SE_j + \Delta$ is expressed as:

(14) $(-(S_j(f) P_d = \phi_j = \Phi_j(\bar{S}_j(f) + \Delta, \bar{X}, \sigma) - \Phi_j(\bar{S}_j(f), X, \sigma)$.

When Δ is small compared with σ, this is approximated by:

(15) $$P_d = \phi_j = 1/\sigma \exp(-(\bar{S}_j(f) + \bar{X})^2/2\sigma^2),$$

apart from irrelevant constant multipliers.

Equation 13 expresses the probability of passage through CPA without counterdetection. Equation 15 expresses the probability of counterdetection at range greater than CPA. These equations are the mathematical model of our problem, i.e., the logical linkage between the hidden variables and the observables.

Inasmuch as this model is complicated, recapitulation is worthwhile. First, the probabilistic nature of the model must be stressed. The equations relate the hidden

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variables to the probabilities of observable events. The hidden variables are not causal. A change in the hidden variables does not guarantee a change in the observables, but only in their probability of occurrence. It is a strength of statistical methods that a deterministic model is not needed. Access to the hidden variables can be gained through the laws of probability alone.

The model's completeness and its implications for intelligence data collection must also be stressed. We have emphasized the occurrence or nonoccurrence of a counterdetection as the principal observable related to X and f_0. The model equations contain additional variables: $\overline{S}$, σ, and ξ. To be determined is whether these variables impose specific data requirements. $\overline{S}$ contains those terms of the sonar equation which can be measured in intelligence applications. That they are knowable does not imply that they will be known without considerable care and effort. The variables will be different in each submarine encounter, and must be systematically recorded if the principal observables are to have any value. $\overline{SL}$ depends on the acoustic characteristics of the U.S. submarine involved, as well as on its operating mode during the encounter. $\overline{PL}$ depends on the range between submarines and on the thermal structure of the ocean at the time and place of encounter. $\overline{AN}$ depends on the local ambient noise, the presence of interfering shipping, and the speed of the enemy submarine. Each of these items must be recorded during submarine encounters.

According to equation 9, σ contains both known σ_S and unknown parts. Although σ_S could be measured, it could not be separated from the effects of σ_X. Thus, σ will have to be estimated by the same techniques used for $\overline{X}$. Data collection related to σ_S would be superfluous.

ξ appears in the model only as a dummy variable of integration. Its effect has been accounted for through the assumption about the form of its probability distribution; it requires no data collection.

The model's universality and its relevance to intelligence must also be emphasized. The model has been employed widely by many nations in analysis of undersea warfare. It contains only elements which can be empirically verified and are accepted by naval analysts. It is, of course, approximate, but it is generally applicable. Furthermore, none of the elements is so specialized that the model would be expected to fail in actual intelligence operations. The sole difference between the model as we employ it and its conventional employment is the reversal of the roles of the known and unknown variables. In conventional applications, the terms of the sonar equation are known, and the probability of detection is to be calculated; here, certain unknown terms of the sonar equation are computed from known detection performance.

Selection of an estimation technique is the final step. Van Trees [10] thoroughly discusses the available estimation methods. Choice of an appropriate method is governed by two considerations: the nature of the quantities to be estimated (stochastic variables or fixed, but unknown, parameters), and the criteria which the estimated values should satisfy.

In the present case, we wish to estimate $\overline{X}$, f_0, and σ. $\overline{X}$ is a fixed parameter by definition, since the stochastic part of X has already been removed. Arguments could be presented for considering f_0 and σ either fixed or stochastic. For simplicity, we assume that they are fixed, also.

The criteria to be satisfied by the estimated values are generally technical, relating to bias, dispersion, and efficiency of the estimates. A technique that estimates

[10] Van Trees, *Op. cit.*, Part I, p. 52 *et seq.*

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fixed parameters, and that has the desired technical properties (for large samples, at least), is called maximum likelihood estimation (MLE). It is this MLE technique that we have found most useful for a variety of problems, and for the passive sonar problem in particular.

The core of the MLE technique is the likelihood function. This is a mathematical function that expresses the probability (or likelihood) of a particular set of observations, given the assumption that the factors contributing to the outcome have specified values. Depending on the values assumed for the contributing factors, the value of the likelihood function may be large or small, corresponding to highly likely or extremely remote outcomes, respectively. The MLE method finds the set of values for the contributing factors which produces the maximum value of the likelihood function. Such values are assumed to provide the most plausible explanation for the observed events.

The observed events in our problem are the submarine encounters, resulting in either counterdetection or no counterdetection of the U.S. submarine by the enemy. Equations 13 and 15 provide the probabilities of outcome for individual events. We consider as a basic data set only events that can be considered to be independent (isolated in space or time). They are then treated as statistically independent events.[11] Therefore, the likelihood function for the whole set is the product of probabilities for the individual events. If our set contains N nondetection events and D detection events, the likelihood function is:

$$(16) \quad L\ (\overline{X},f,\sigma) = K \prod_{i=1}^{N} \left[1 - \Phi_i(\overline{X},f,\sigma)\right] \prod_{j=1}^{D} \Phi'_j\ (\overline{X},f,\sigma)\bullet$$

The absolute magnitude of the likelihood function is unimportant, since we are concerned with only the location of its maximum. The multiplying factor, K, is included in equation 16 as an adjustable parameter to avoid overflow or underflow in digital computer calculations. The significant parts of the likelihood function are all contained in Φ_i and Φ'_j, through their dependence on $\overline{X}$, f, and σ.

For some simple likelihood functions, the location of the maximum can be found by basic methods of calculus. Such is not the case here. There is no analytical solution giving the maximum of equation 16. A computer search must be used, which is initiated by making reasonable guesses for $\overline{X}$, f_0, and σ, and by calculating L. The inputs are then systematically varied around the initial guess until the largest value of L is established. Clever guessing can reduce the computation time, but cannot eliminate the dependence on a computer for the success of this method.

The desired estimates of the original hidden variables, $\overline{X}$ and f_0, and the peripheral quantity, σ, are obtained by inspecting the computer printout. Apart from the issue of deception, the problem is solved.

Deception can be incorporated into our model as follows: Define an overtness factor, β, $(0 \leq \beta \leq 1)$, as the fraction of true counterdetections that are correctly perceived by the U.S. submarine. $\beta = 1$ represents no effective deception; $\beta = 0$

[11] This assumption is not always satisfied, and further research is needed on the implication of relaxing this assumption.

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represents complete deception. This is incorporated in the likelihood function by changing Φ_i to $\beta\Phi_i$, and Φ'_j to $\beta\Phi'_j$. The modified likelihood function is then:

$$(17) \quad L(\bar{X},f,\sigma,\beta) = K \prod_{i=1}^{N} (1 - \beta\Phi_i) \prod_{j=1}^{D} \beta\Phi'_j \cdot$$

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CRYPTOGRAPHY DURING WORLD WAR I:

A TSARIST RUSSIAN'S VIEW

General-Major N. Batyushin

Translator's Introduction:

This document, long lost and only recently recovered—at least in English—gives some additional perspective of the state of Russian knowledge of communications intelligence in World War I by a man with a fascinating intelligence background.

General-Major Nikolaj Stepanovich Batyushin[1] *was a high official in the Tsarist Russian military intelligence service both before and during World War I. This article, which appeared in the June-July, 1928, issue of the Imperial Yugoslav Armed Forces General Staff bi-monthly journal* Ratnik *(Soldier), is one of a handful of known post-war traces of the general.*

Russian military intelligence prior to 1917 was centered in two areas: the General Staff of the Armed Forces, and the military districts along the border of the Russian Empire.[2] *The intelligence service of the General Staff was the 5th Bureau* (deloproizvodstvo) *within the 1st Department of the Operations (Quartermaster-General) Directorate, largest of the three directorates of the General Staff. Russian military attachés in major foreign capitals reported directly to the 5th Bureau. The intelligence sections attached to the military districts aimed their efforts at those foreign countries lying along their respective borders.*

In 1902 Batyushin, then a major, as chief of Espionage Center West, the intelligence section attached to the Warsaw Military District, operated against both Germany and Austro-Hungary. He has generally been credited with recruiting the chief of the Operations Section (clandestine activities and counterintelligence) of the Intelligence Bureau of the Austro-Hungarian General Staff, then-Capt. Alfred Redl, as a Russian agent. Redl, subsequently a colonel and Deputy to the Chief of the Intelligence Bureau, sold codes, fortification plans, weapon designs, mobilization plans, and other critical information to the Russians and later, as his need for money increased, to the Italians and French as well. The exposure of Redl's treason after his suicide on May 25, 1913 forced heavy expenditures and major disruption of planning by the Austro-Hungarian armed forces in the 14 months that remained before the outbreak of World War I. In some aspects the Batyushin-Redl relationship was similar to the more recent KGB relationship with its British agent, H. R. "Kim" Philby; Redl and Philby were each in charge of operations against Russia for the intelligence services of their respective countries. But the intriguing character of Batyushin made the Redl case unique. Attracted by Redl's debts, Batyushin had watched Redl advance for more than 10 years to a position where he

[1] The name has been spelled "Batjuschin" in the relatively few German and English references to the general in articles discussing the Redl case. [He is known to have been a lecturer in the Foreign Higher Military Science courses given in Belgrade from 1933 to 1938 by the Yugoslav armed forces.]

[2] See "Russian Intelligence in World War I, 1914-1918," in the Soviet periodical *Voenno-Istoricheskij Zhurnal* (Journal of Military History) *No. 5, 1964,* as well as "From the History of the Russian General Staff," *ibid., No. 7, 1972, No. 12, 1974, and No. 3, 1976.*

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could be useful to Russia before making the recruitment approach, now buttressed by knowledge of Redl's homosexual activities. Some writers theorize that Redl, hooked, in turn blackmailed Batyushin over the latter's embezzlement of operational funds, and the two men advanced each other's reputations as spy catchers by betraying minor agents to each other.[3]

Thomas R. Hammant

Even before the invention of wireless telegraphy, cryptography [*tajnopis*] played a large role in diplomacy, the army, and navy, but now, when anyone can receive radiotelegraphic communications anywhere in the world, the significance of secrecy in enciphering these radiotelegraphic communications takes on a special importance. Radiotelegraphy, (while) facilitating communications to the frontiers between separated armies and naval fleets, operating at long distance, at the same time, to a considerable extent, also aided the operations of the secret intelligence service, i.e. the obtaining of reports on the enemy's operational plans.

That eagerly guarded secret became the property of uninitiated persons as well, in the view of the enemy's enciphered radiotelegraphic communications, and now the difficulty lies only in deciphering the communications. Because of that, at the beginning of the war, the combatant sides strove to learn the cipher system of their enemies by using their own scientific knowledge.

In the February [1928] issue of the journal *La Revue Maritime,* which is published by the Chief of the General Staff of the French Navy, there appeared an interesting comment on the work of the English Admiralty during the World War. The Admiralty succeeded in constantly shadowing the movements of the German Fleet and discerning its operational intentions. The basis of this comment was the report by the Dean of the Edinburgh University to the Philosophy Society, which stated the manner in which the English Admiralty had organized the intercept and decrypting of German radiograms.

At the beginning of the war, according to the Dean's report, the English Admiralty turned to the well-known Alfred Ewing with the request that he study the problems of decrypting the enemy's radiograms. He began this task with a few assistants whose number had grown to 50 cryptanalysts by the end of the war.

It goes without saying that not only the work dealing with decrypting radiograms, but also the very fact of the existence of such a service, was highly secret. As a result, in the English Admiralty this service worked with great circumspection. To those few persons who were initiated into its existence, the service was known by the name "Room 40." The number of enemy radiograms, intercepted by a multitude of auxiliary radio stations set up along the shore, sometimes ran as high as 2,000 a day.

Several copies of German documents [codebooks] fell into the hands of the English, which gave "Room 40" the opportunity to study the German encryption system. However, the loss of the codebooks also caused many enemy Ambassadors to change their codes.

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[3] For a comprehensive albeit fictionalized study of the Redl case and General Batyushin's purported role in it, see Robert Asprey, *The Panther's Feast* (G. P. Putnam's Sons, New York, 1959). [A more revisionist treatment of the Redl case permits questioning of Batyushin's role. In his own lectures Batyushin discusses the Redl case but claims no direct role in it as recruiter or handler (Batyushin, *Tainaya Voennaya Razvedka i Bor'ba c'Neii* (Secret Military Intelligence and its Struggle) (Nov'Zhivot' Press, Sofia, 1939). Maj. Gen. M. Mil'shteyn's "The Case of Colonel Redl," *Voenno-Istoricheskij Zhurnal, Jan. 1966,* contains heretofore unpublished material from Russian files which identify Redl's recruiter and handler as Colonel Mitrofan Konstantinovich Marchenko, the Russian Military Attaché in Vienna from 1905 to 1910. Editor.]

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By December 1914, the work of "Room 40" had improved to the extent that the German Fleet could not make any move which the English Admiralty did not earlier know from prepared German radiotelegraphic reports and orders.

According to German Corvette Captain Krashutskij, who was well-known for his official work on German naval encryption systems, these were rarely changed, and no consideration was given to the very great possibility of the systems falling into unfriendly hands on frequent occasions when submarines were sunk in shallow waters. Suppose the German radio telegraph officers—relates Krashutskij—accidentally forgot to take the new cipher code with them, they could easily put it together by the first received signals. Therefore, it wasn't any wonder that the English were able to decrypt the German radiograms so easily. It was only in 1916 that the Germans began to notice now quickly their radiograms were being decrypted by any radiotelegraphic station, even one without a special decryption apparatus.

As a result, in Germany, research work was completed on a new encryption system, which was more secure than their previous one, and had a daily change of cipher keys.

From the beginning of the war until 1916, not once had the Germans changed their ships' callsigns, all of which were known to the English. Only before the Battle of Jutland did the Commander-in-Chief of the German Fleet find it necessary to change the ships' callsigns. For example, the callsign of the Admiral's flagship was DK, and the callsign for the harbor at Wilhelmshaven was UW. The English were misled by this change into believing that the Admiral's flagship was still in Wilhelmshaven, when the Battle of Jutland began, as they were still monitoring the entire German Fleet.[4] A period of time elapsed before the report of the Commander of the English cruiser *Southampton* reached the English Admiralty and made clear the situation.

The skilled, organized work of "Room 40" enabled the English Admiralty to be correctly informed of the time of arrival and the correct course of the German ships, which had participated in the Battle of Dogger Bank, as the intercept of the German radiograms disclosed the existing disposition of the ships.

Almost the same procedure was followed before the Battle of Jutland, when German radiograms gave the English sufficient information about the enemy's plan of action. Thus the Battle of Jutland came as no surprise to the English.*

"Room 40" took a keen interest in the decryption of those radiograms which the German government sent to its diplomatic representatives in Madrid, North and South America, Constantinople [*Tsar'grad*], Athens, Sofia, and elsewhere. Thus, the English received timely information on German activities in Ireland, Persia, and Mexico. In a radiogram signed by [German Foreign Minister] Zimmerman to the German representative in Mexico, Germany agreed conditionally to offer a union with Mexico against the United States. This sensational discovery was secretly communicated by

[4] [For a slightly different version of this incident, see Patrick Beesly, *Very Special Intelligence* (Hamilton, London, 1977). Editor]

* The aforementioned discoveries by Professor Ewing provoked a controversy in England. Certain organs of the English press stated that shortly before the Battle of Jutland England was fully aware of the situation, while others stated that thanks to the decryption of the enemy's radiograms, the English knew only of the intentions of Admiral Hipper who took his squadron out to sea, and Admiral Scheer's changing his callsign with Wilhelmshaven. This indicated unusual activity taking place in Jade Bay. In regard to the departure of the entire German fleet to sea under Admiral Scheer, England recognized this situation only from the report of the commander of the cruiser *Southampton*, who saw the German fleet at sea. Because of this, the Battle of Jutland came as no surprise to the English. [This footnote is part of Batyushin's original article. Numbered footnotes have been supplied by the translator or the editor.]

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[British Foreign Minister] Balfour to the United States Ambassador in London, Mr. Page, in turn for President Wilson. This radiogram, when made public by Wilson, played a decisive role in turning American public opinion in favor of the inevitability of war with Germany.

A similar beginning took place in the decryption service in Germany. In a secluded place in Neumünster, behind a series of barbed wire barriers, the Germans also set up a "Room 40" to decrypt enemy radiograms. The Germans had to overcome incomparable difficulties in breaking the English encryption system, which incorporated several systems of cipher keys. In the end, the Germans overcame the problems, but were not able to take advantage of this success for very long.

The decrypted telegrams of the Russian Army radio stations were of incomparably greater use to the Germans. These circumstances explain the brilliant successes of the Germans in 1914 at the battles of Tannenberg and Lodz.[5] The German Commander-in-Chief was able to discern the enemy plans based on fragments of enemy reports which were regularly transmitted under modern battle conditions. The German Command-in-Chief was able to discern the enemy's plans through the information revealed by means of decrypting the enemy's radiograms without risk. The same circumstance explains the enormous success of the Germans against the 2nd Army of General Samsonov at Tannenberg, and further explains the German capability to extricate themselves from the pocket into which they fell at Lodz hoping to encircle the 2nd and 5th [Russian] Armies at Lodz.

General Ludendorff, on page 119 of his book *War Reminiscences*, explains the brilliant success of the German forces at Tannenberg in the following manner:

> Our reconnaissance detachment really was very good at spreading false information (rumors) so that neither the Russians nor their allies could learn our true intentions. It is very difficult to acquire accurate reports on an enemy, but on the other hand to carry on a war, especially with an enemy who is numerically weak, is quite easy. At Tannenberg "we hit it right."
>
> I will not dwell on the fact that the English Admiralty likewise met with success in perceiving the operational intentions of the German Naval Forces Commander-in-Chief. I will just comment on "good luck," which literally fell from the sky on the Germans at Tannenberg.

The German General von Francois, on page 201 of his book, *Marneschlacht und Tannenberg*, states among other things that on 25 August 1914, at 8 o'clock in the morning at Mantovo, General Ludendorff reported the following information on the enemy:

> VI [Russian] Corps, on the flank guarding the Narev [2nd] Army would advance through Ortelsburg to Bischofsburg.
>
> The Russian XXIII Corps would advance from Neidenburg at Allenstein. Its forward units would be positioned along the Gimmendorf-Kurken line.
>
> The Russian XXIII Corps itself would be positioned along the Nadrau-Paulsgut line.

---

[5] [General Batyushin, with his references to decryption at Tannenberg, is either covering up or was never informed of one of the major Russian blunders of the entire war: The Russians had codes, but at the forward communications echelons, where the orders had to leave the landlines and take to the air, so few codebooks had been distributed that the entire Russian strategy had to be laid bare in the clear for the Germans to intercept. Editor.]

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> The Russian XV Corps would fight against the German XX Corps on the line of Gardienne-Michalken.
>
> The Russian I Corps—on the left flank of the Narev Army—would move from Mlawa through Soldau-Usdau to Gilgenburg.
>
> The Russian Cavalry Crops would stay at Lautenburg and Strasburg.

The orders for the 8th German Army for 28 August are presented on page 209 of the von Francois book:

> The I Reserve and XVII Corps will carry the battle with the front to the south, with the VI Russian Corps. Behind it in the area of Gerdauen-Drengfurt *will be the left flank of the Vilensk* [*1st*] *Army*. [Emphasis added by author.]
>
> The remaining Russian forces will advance from Kurken and east of it toward Allenstein. . . .

Such detailed insight on the operational intentions of the enemy could not be the result of ground or aerial reconnaissance alone. The priceless information had to come from intelligence service documents and, in particular, from decrypted enemy radiograms. General von Francois indicated as much in his book:

> "On 27 August the Army staff reported on the unavoidable necessity to strengthen the Soldau flank, where, judging by an intercepted radiogram, enemy actions by the Warsaw Guards were contemplated." (p. 211)

In this manner, the daring and brilliant action of General Ludendorff's plan (to leave only two cavalry brigades opposite the 1st Vilensk Army of General Rennenkampf, and to concentrate all the forces of the 8th Army to encircle both flanks of the 2nd Army of General Samsonov was based *on precise information, not only on disposition (of troops), but also of the operational intentions of the enemy's armies*. [Emphasis added by author]

The same situations occurred in the Battle of Lodz during late autumn of 1914 when the Germans, finding their forces surrounded by the 2nd and 5th Russian Armies, broke out of the Russian encirclement. The Russian Commander-in-Chief of the Northwest front then fell into the same pocket and was extricated only after sustaining great losses. The Germans had organized an excellent decryption service and had decrypted the enemy radiograms.

General Ludendorff discusses the situation in his book *War Reminiscences* in the following manner:

> According to intercepted radiograms, the Russians believed that our forces were of large numbers at Lodz. However, the strong will of the (Russian) Grand Duke (Nicholas) served to hold his Corps in place and not to move it. We learned of this situation from other radiograms and were very disappointed. (p. 100)

It is apparent from the above that from the very beginning of the war, on the Russian front, the Germans had skillfully organized a service for not only decrypting Russian radiograms, but intercepting them as well. This explains General Ludendorff's statements in regard to the brilliant activity of the Germans on that front. The Chinese writer U Tse, who lived in China during the 4th Century B.C., said "an enemy who is spied upon is conquered."

It can be maintained with great probability that a similar decryption service was organized at the beginning of the war by the Germans against France on the western front.

The first successes of the Germans on that front can be assumed by their success in decrypting the English naval encryption system and the results gained from attacking French ciphers.

In regard to the French, a decryption service was organized within the ministries of the army and navy, both of which worked in close contact with the English Admiralty. The difficulty of the work of the French decryption service may be judged by the facts that the positions were filled with difficulty and the number didn't exceed one tenth of the number of persons working in the English "Room 40."

A decryption service was also set up on the Russian side, but precise information concerning it is lacking even today.

The above brief description has shown that the secret intelligence service is a powerful weapon in the hands of energetic commanders. It also shows how great a need there is for deep knowledge and vigilance in creating and using ciphers, in general, as well as in radiotelegraphic communications.

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Soviet obituaries: a gold mine of intelligence

THE ARCANE ART OF NECROLOGY

L. Ben Freudenreich

When Semen Kosberg, Chief Designer of rocket engines, died in 1965, we in intelligence did not know who he was. He had been directing the development of rocket engines for 11 years and had been responsible for upper-stage engines in space launch vehicles, but his name had not appeared in intelligence reports; the only open-source references to him were his listing as one of the delegates to the 22nd Party Congress in 1961 and two mentions in World War II government awards listings in *Vedomosti Verkhovnogo Soveta*. There had been no reports of the existence of the engine design bureau under his direction.

Kosberg's obituary (published in the January 5, 1965, issue of *Pravda*) stated that he had been a "Chief Designer of Aviation Engines" and had been awarded a Lenin Prize "for outstanding achievements in the field of engine construction." The obituary added that over a 34-year period Kosberg had worked for various organizations of the aviation industry. The World War II awards listings gave his position as a Chief Designer at an unspecified plant of the aviation industry, and the 22nd Party Congress listing indicated that he was an "engineer-technician" from Voronezh.

Ivan I. Abramov, one of those who signed Kosberg's obituary, also was a delegate to the Party Congress and was listed as an "engineer-technician" from Voronezh. Almost all of the signers were well-known chief designers, plant directors, and officials of the Ministry of Aviation Industry (MAP). This limited information permitted the tentative conclusions that Kosberg's design bureau was subordinate to MAP and was located in Voronezh.

In 1967, A. D. Konopatov, another of the signatories, was elected as a Deputy to the USSR Supreme Soviet from the Voronezh Oblast. Evidently he had succeeded Kosberg, for he was listed as "leader of a design bureau at a mechanical plant." Had it not been for the Kosberg obituary and its list of signatories, little significance would have been attached to the Konopatov information.[1]

Learning of the existence of this design bureau gave us new insight into the size of the resource base for the development of engines and enabled us to target both the Voronezh facility and its associated personnel for collection of intelligence about Soviet efforts in engine development. The identification of Konopatov and Abramov as engine design personnel assists us in assessing the intent of any patents or other technical literature that they might author. Moreover, because Kosberg's OKB (experimental design bureau) was a MAP facility, we gained new insights into the roles played by MAP in the development of aerospace hardware as subsequent commemorative articles praised Kosberg and identified his contributions.

The Kosberg case is just one of several where a published obituary has provided analysts with important information about key personalities and organizations in the Soviet Union. By no means, however, have all or even most of the available obituaries been fully exploited. One reason they have been bypassed is that the relevant ones do not appear at times when the information they might yield could contribute to current

[1] A. D. Konopatov was elected to Corresponding Membership in the Department of Physical-Technical Problems of Energetics of the Academy of Sciences USSR in December 1976.

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analysis tasks. Analysts often are reluctant to take time to identify the 50 or more signers of an obituary for a person who is not of current and immediate interest.

Analysts also hesitate to draw too many conclusions from analysis of a single obituary. They have felt that not enough is known about the Soviets' protocols for publishing obituaries, nor about their common practices for choosing the form of obituary that the deceased would get, or deciding who would sign, if anyone. Consequently, the analysts have been cautious in trying to explain the presence or absence of individual signatories' names, their positions in the list, or their relationship to the deceased and his work.

In a mid-1967 sampling, more than 260 Soviet obituaries and death notices [2] were retrieved from the CIRC data base [3] and analyzed in detail. The analysis has provided much background information that would have facilitated analyses of obituaries in the past and will be helpful in future attempts. This examination also confirmed the suspicion of many analysts that the obituaries that have been entered into intelligence data bases over the past several years are an important information resource that remains largely untapped.

Who Rates a Published Obituary?

Whether a death is noted by an obituary, or even a death notice, depends on the deceased's prominence and the rank or importance of his position in the government or the Party, in industry, the Academy of Sciences, or educational institutions, or in the military. A person's death usually is not noted in any way unless the person is at least the head of a department, laboratory, or chair of an R&D or educational facility, or is very prominent because of his scientific or technical achievements. Most of the obituaries and death notices are carried in *Pravda, Izvestiya*, *Vechernyaya Moskva,* and *Krasnaya Zvezda*. The others appear in a variety of less widely circulated newspapers.

The obituaries with signatures give the deceased's most recent positions, his honorary titles, and so forth (see Figure 1). Then they present a short biography, which is followed by a list of signers. Death notices and obituaries without signatures list the submitting organizations. Usually these are facilities with which the deceased was associated and may include the higher-level ministries or state committees under which he worked. If he was a member of an Academy of Sciences, its presidium and appropriate departments are listed as submitting organizations. The Party committee of the facility or the city *rayon* appears for Party members. Professional societies and trade unions are listed when appropriate. Most of those announcements submitted by organizations are simply death notices; only a few give biographies. Obituaries with signatures and those that are signed by "a group of comrades" do not list submitting organizations.

Signed obituaries generally are published for individuals holding the following kinds of positions:

- Ministers or chairmen of state committees and their deputies.
- Heads of main administrations.

[2] Obituaries give historical biographic information; death notices do not.

[3] CIRC (Central Information Reference and Control) is a very large technical intelligence information system that is operated at Wright-Patterson Air Force Base by the Foreign Technology Division, Air Force Systems Command.

Сергей Владимирович ИЛЬЮШИН

После продолжительной, тяжелой болезни 9 февраля с. г. на 83-м году жизни скончался выдающийся конструктор самолетов, член КПСС с 1918 года, трижды Герой Социалистического Труда, лауреат Ленинской и Государственных премий, действительный член Академии наук СССР Ильюшин Сергей Владимирович.

В лице С. В. Ильюшина наша страна и советское самолетостроение потеряли крупного ученого и выдающегося авиационного конструктора.

С. В. Ильюшин родился 31 марта 1894 г. в деревне Диляево Вологодской губернии в семье крестьянина. Учился в земской школе. С 1909 г. начал свою трудовую деятельность в качестве подсобного рабочего.

В 1914 г. был призван в армию и вскоре направлен в аэродромную команду Северного района управления ВВС. С этого времени его жизнь была неразрывно связана с авиацией. С мая 1919 г. находился в рядах Красной Армии в авиационно-ремонтных частях.

В 1921 г. он был направлен в Институт Красного Воздушного Флота, ныне Военно-воздушную академию им. проф. Н. Е. Жуковского. Будучи слушателем академии, построил несколько планеров своей конструкции. В 1926 г. после окончания академии С. В. Ильюшин был назначен председателем одной из секций научно-технического комитета ВВС.

В 1931 г. С. В. Ильюшин был переведен на работу в авиапромышленность, где руководил работой Центрального конструкторского бюро. С этого момента началась его творческая деятельность в области создания отечественных самолетов.

Начиная с 1933 г. он был главным и генеральным конструктором КБ по проектированию самолетов, ставшего впоследствии одним из ведущих в нашей стране. На этой работе полностью развернулся его талант конструктора и ученого.

Коллективом под руководством С. В. Ильюшина были созданы самолеты с высокими летно-техническими характеристиками, на которых был установлен ряд мировых рекордов и совершен перелет из Москвы в Северную Америку, а также штурмовик ИЛ-2 и другие самолеты, сыгравшие большую роль в победе Советской Армии в Великой Отечественной войне.

Больших успехов коллектив, возглавляемый С. В. Ильюшиным, добился в создании советской гражданской авиации. Самолеты ИЛ-12, ИЛ-14, ИЛ-18, ИЛ-62 стали основными средствами воздушного транспорта в СССР и широко известны за пределами нашей страны. А самолет ИЛ-62 является флагманом Гражданского воздушного флота.

Неутомимый поиск новых решений, большая научная эрудиция, творческая смелость при решении сложных технических проблем сочетались у С. В. Ильюшина с блестящими организаторскими способностями, исключительной скромностью и высокими душевными качествами.

С. В. Ильюшин имел огромный авторитет и пользовался большой любовью и уважением у всех, кто работал с ним и знал его. Он воспитал многочисленные кадры конструкторов и инженеров, успешно решающих задачи дальнейшего совершенствования и развития авиационной техники.

С. В. Ильюшин активно участвовал в общественной жизни страны, был делегатом ряда съездов КПСС, депутатом Верховного Совета СССР семи созывов. Плодотворная деятельность Сергея Владимировича Ильюшина на благо нашей Родины заслужила признательность советского народа и отмечена высокими правительственными наградами. За выдающиеся заслуги перед Родиной в развитии советской авиации он был трижды удостоен звания Героя Социалистического Труда, звания лауреата Ленинской и Государственных премий, награжден многими орденами и медалями Советского Союза.

Светлая память о выдающемся авиационном конструкторе Сергее Владимировиче Ильюшине — верном сыне Коммунистической партии, пламенном патриоте социалистической Родины навсегда сохранится в наших сердцах.

Л. И. Брежнев, Ю. В. Андропов, В. В. Гришин, А. А. Громыко, А. П. Кириленко, А. Н. Косыгин, Ф. Д. Кулаков, Д. А. Кунаев, К. Т. Мазуров, А. Я. Пельше, Н. В. Подгорный, Г. В. Романов, М. А. Суслов, Д. Ф. Устинов, В. В. Щербицкий, Г. А. Алиев, П. Н. Демичев, П. М. Машеров, Б. Н. Пономарев, Ш. Р. Рашидов, М. С. Соломенцев, И. В. Капитонов, В. И. Долгих, К. Ф. Катушев, М. В. Зимянин, К. У. Черненко, Я. П. Рябов, Л. В. Смирнов, В. А. Кириллин, Н. К. Байбаков, И. Д. Сербин, П. В. Дементьев, Б. П. Бугаев, С. А. Афанасьев, С. А. Зверев, В. В. Бахирев, М. В. Егоров, П. С. Плешаков, Э. К. Первышин, А. И. Шокин, Е. П. Славский, А. П. Александров, Г. А. Титов, М. П. Георгадзе, Н. В. Огарков, П. С. Кутахов, С. Г. Горшков, Н. Н. Алексеев, Н. С. Строев, В. А. Казаков, М. С. Михайлов, И. С. Силаев, Н. А. Дондуков, М. А. Ильин, И. А. Салащенко, Ю. А. Затейкин, И. М. Буров, М. Н. Мишук, О. К. Антонов, Р. А. Беляков, П. Д. Грушин, Г. В. Новожилов, А. А. Туполев, А. С. Яковлев, В. М. Мясищев, Н. Д. Кузнецов, А. М. Люлька, Г. П. Свищев, В. В. Уткин, С. М. Шляхтенко, А. В. Болбот, А. Ф. Белов, Е. А. Иванов, Я. А. Кутепов, В. А. Борог, В. И. Смирнов, А. В. Шапошников.

Figure 1
Obituary of Aircraft General Designer S. V. Ilyushin in Pravda, Feburary 11, 1977

- Heads of principal components of state committees, e.g., head of the central computer center of GOSPLAN.
- General designers and chief designers in the aerospace industry.
- Marshals, generals, admirals, and vice admirals.

Persons in the following positions usually are given either death notices or obituaries without signatories:

- Rectors of higher educational institutions.
- Plant directors, chiefs and deputy chiefs of institutes.
- Chief designers of aircraft accessory equipment.
- Deputy chief designers in the aerospace industry.
- Heads of departments, laboratories, faculties, and chairs.

Individuals with positions in the latter group sometimes get obituaries with signatures. Membership in Academies of Sciences, honorary titles, and Lenin and State Prizes evidently are positive factors in deciding whether an obituary will be published and what form it will take. For example, 20 percent of the deceased in the sample had won Lenin and State Prizes, and a similar number were "Meritorious Scientist" (or engineers). Many civilians were Heroes of Socialist Labor, while Heroes of the Soviet Union were common among the military. For unknown reasons, some deceased who held positions in the first group only were accorded death notices or obituaries signed simply "a group of comrades."

Although even the death notices sometimes reveal information that the Soviets previously have concealed, the obituaries with signatures present the best opportunities for analysis. The remainder of this discussion, therefore, is devoted to pointing out those opportunities and showing how knowledge of Soviet obituary protocol can be capitalized upon by intelligence analysts.

Within the group of deceased who received signed obituaries, there is further categorizing—again on the basis of prominence, importance, and rank. Obituaries for those at the highest level are signed by Party General Secretary Brezhnev, followed by all of the members and candidate members of the Politburo, and the members of the Party Secretariat who are not with the Politburo. In Figure 2, names of the signers are arrayed against the obituaries that were signed by Brezhnev and Kosygin. To the extent possible, the order of the names down the left side of Figure 2 is the same as the order in which the signatures are listed on the obituaries.

Deputy ministers, heads of main administrations, directors of facilities, and chairmen of republic state committee do not rank high enough to warrant Brezhnev's signature. Sometimes D. F. Ustinov signs, but usually the higher-level signers are deputy chairmen of the Council of Ministers, or are from the ministry or state committee in which the deceased had a position. When the deceased is from one of the republics, the first signature usually is that of the Secretary of the Central Committee of the Party in that republic, or is the chairman of the republic Council of Ministers.

Not all high-ranking military officers rate signatures from Brezhnev or other members of the Politburo. On 12 military obituaries not shown in Figure 2, the highest-ranking signatory was A. A. Grechko, evidently in his role as Minister of

Signatories and Their Positions		Skryabin (Academician)	Tupolev (Gen. Designer, MAP)	Blagonravov (Academician; Lt. Gen)	Gusenkov (Minister)	Kadyshev (1st Dep. Minister)	Kalmykov (Minister)	Kamov (Gen. Designer, MAP)	Sukhoy (Gen. Designer, MAP)	Yakubovskiy (Minister)	Ryabikov (1st Dep. Chm. GOSPLAN; Col-Gen.)	Zhukov (Minister, MO)	Starovskiy (Hd. Central Stat. Admin., CM)	Artsimovich (Academician)	Anokhin (Academician)	Kalashnik (Dep. Chm. Main Polit. Adm.)	Soich (Plant Director)	Khalipov (Col-General)	Yumashev (Former C in C, Navy)	Kuznetsov (Vice Admiral)	Kraynyukov (Col-General)	Vishevskiy (Col-General)	Khetagurov (General of Army)	Gastilovich (Dep. Hd., Acad. Gen. Staff)	Furduyev (Dep. Min)	Yefremov (Dep. Chm., GOSSNAB)	Shishov (Dep. Min., MM)	Solomonovich (Chief of Main Admin.)	Lebedev (Institute Director)	Sablev (Former Plant Director)
Politburo Full Members	Brezhnev	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•						
	Andropov			•	•	•	•	•	•	•	•	•								•										
	Voronov	•	•																											
	Grechko			•	•	•	•	•	•	•	•	•				•	•	•	•	•	•		•	•						
	Grishin	•	•	•	•	•	•	•	•	•	•	•	•	•	•															
	Gromyko			•	•	•	•	•	•	•	•	•																		
	Kirilenko	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		•			•									
	Kosygin	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		•								
	Kulakov	•	•	•	•	•	•	•	•	•	•	•	•	•																
	Kunayev	•	•	•	•	•	•	•	•	•	•	•																		
	Mazurov	•	•	•	•	•	•	•	•	•	•	•	•	•	•															
	Pelshe	•	•	•	•	•	•	•	•	•	•	•	•	•																
	Podgornyy	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		•								
	Polyanskiy	•	•	•	•	•	•	•	•	•	•	•	•																	
	Suslov	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•														
	Shelepin	•	•	•	•	•	•	•		•	•	•																		
	Shelest	•	•																											
	Shcherbitskiy	•	•	•	•	•	•	•	•	•	•	•					•													•
Politburo Candidate Members	*Andropov	•	•											•																
	Demichev	•	•	•	•	•	•	•	•	•	•	•		•	•														•	
	Masherov	•	•	•	•	•	•	•	•	•	•	•																		
	Ponomarev	•	•	•	•	•	•	•	•	•	•	•		•	•															
	Rashidov	•	•	•	•	•	•	•	•	•	•	•																		
	Romanov			•	•	•	•	•	•	•	•	•																		
	Solomentsev	•	•	•	•	•	•	•	•	•	•	•	•	•																
	Ustinov	•	•	•	•	•	•	•	•	•	•	•		•		•	•	•		•							•	•	•	
Central Committee (CC) CPSU Secretariat	Dolgikh		•	•	•	•	•	•	•	•	•	•		•			•	•												
	Kapitonov	•	•	•	•	•	•	•	•	•	•	•		•																
	Katushev	•	•	•	•	•	•	•	•	•	•	•		•																
	*Kirilenko																													
	*Kulakov																													
	*Ponomarev																													
	*Suslov																													
	*Ustinov																													
CC Central Audit Comm. Chm.	Sizov											•	•																	
Acad. Sciences USSR President	Keldysh	•		•										•	•															
Council of Ministers (CM) USSR Presidium	*Kosygin																								•	•	•	•		
	*Mazurov																										•			
	Arkhipov				•		•			•	•		•																	
	Baybakov				•	•	•		•	•	•		•												•	•				
	Dymshits				•		•			•	•		•												•	•				
	Kirillin, V. A.	•	•	•	•		•			•	•		•	•	•														•	
	Leshechko				•		•			•	•		•																	
	Novikov, V.		•		•		•			•	•		•												•	•	•			
	Novikov, I.				•		•			•	•		•												•					
	Nuriyev				•		•			•	•		•																	
	Smirnov, L. V.		•	•	•	•	•	•	•	•	•	•	•	•			•												•	
	Tikhonov				•		•			•	•		•												•					
Ministers								•																						
Central Committee CPSU Departments	Bushuyev				•																									
	Dmitriyev									•																				
	Gostev												•																	
	Savinkin			•																										
	Serbin		•	•		•	•	•	•		•			•			•													
	Trapeznikov	•		•	•									•	•															
	Frolov			•																										
CC Central Audit Comm. Chm.	Smirtyukov				•								•																	
Acad. Sciences USSR President	*Keldysh				•		•				•																			
SS RSFSR Chm.	Yasnov																	•												
CC Lat. 1st Sec.	Voss	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•							
Ministers		•	•	•	•	•	•		•	•	•						•								•	•				
Military Leaders								•				•				•		•	•	•	•		•	•						
Academy of Sciences Administrators														•																

* Indicates that the person has a higher position which also is listed.
• Signed obituary of person indicated.
Blank entries did not sign obituary of person indicated.

Figure 2
High-Ranking Signatories on Obituaries

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Defense. All of these deceased held ranks of Colonel General or above. Other military obituaries are signed first by the chief of the deceased's branch of the armed forces. Obituaries of Lt. Generals and Major Generals in military-political roles are first signed by A. A. Yepishev, Chief of the Main Political Directorate of the Soviet Army and Navy; those of Air Force Generals are signed by Air Force Commander-in-Chief Kutakhov; and so forth.

Exceptions: Tip-offs to Significance.

The pattern of prominence and high rank in obituaries signed by Brezhnev, Kosygin, and Podgornyy is so clear that obituaries which do not fit the pattern stand out. Obituaries of plant directors, for example, usually are unsigned, but these three Politburo members and several other individuals holding national-level positions signed the obituary of O. V. Soich, a plant director from Kharhov. Why these individuals signed is not immediately evident; perhaps their signing related to Soich's earlier position as head of the Kharkov Sovnarkhoz.

Soich's obituary (published in the October 1, 1975, issue of *Rabochaya Gazeta*) reported that he was Director of the Kharkov Transport Machinebuilding Plant from 1965 until his death. Previously he had been Chairman of the Kharkov Sovnarkhoz from 1960 to 1965, and during the 1950s he had been Chief Engineer and Director of the Kharkov State Bearing Plant. He had received Orders of Lenin, the Order of the Red Banner of Labor, and the Badge of Honor. Soich was not totally unknown in the West. He was known to have been head of the Kharkov Bearing Plant (1959), and Chairman of the Kharkov Sovnarkhoz (1962-1965). A biography that was published when he was a deputy to the Supreme Soviet in 1971 gave his affiliation with the Transport Machinebuilding Plant.

From the organizational associations of the signers of his obituary, Soich's heavy involvement with the Soviet defense industry, presumably in his position as plant director, becomes evident (Table I). Some of the signers are representatives of the Ukrainian Communist Party and government. Brezhnev, Kosygin, and Podgornyy represent the central government. The remainder of the signers are from the military, the defense industry, and the heavy industry sectors. The defense industry ministers who signed were responsible for development and manufacture of ground weapons, munitions, and ballistic missiles. The Minister of Heavy, Power, and Transport Machinebuilding was the only other minister who signed. The representatives from the Ministry of Defense were from the Ground Forces and the Armored Troops. Since the Armored Troops were the only branch troops represented, it would appear that Soich's plant was involved in the development and/or production of armored vehicles or other devices for the armored troops.

In this case it was possible to determine the activities of the deceased's facility through analysis of the other data. The analysis showed that, in fact, the Kharkov Transport Machinebuilding Plant is the location of the principal Soviet tank design organization and it has played a key role in tank design and production since the 1930s.

The Soich obituary illustrates two points: First, the presence of the signatures of the First Secretary, the Premier, and the President on the obituaries of people whose positions normally would not rate such attention is sufficient cause for us to scrutinize the obituary and the group of signatories.

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Table I

Identification of Signatories on O. V. Soich's Obituary

L. I. Brezhnev	Member, Politburo; General Secretary of the Central Committee (CC CPSU)
A. A. Grechko	Member, Politburo; Minister of Defense
A. N. Kosygin	Member, Politburo; Chairman of Council of Ministers, USSR
N. V. Podgornyy	Member, Politburo; Chairman, Presidium of Supreme Soviet USSR
V. V. Shcherbitskiy	Member, Politburo; First Secretary, CC Ukrainian Communist Party
D. F. Ustinov	Candidate Member, Politburo; apparent defense industry responsibility
V. I. Dolgikh	Member, Secretariat CC CPSU; apparent heavy industry responsibility
L. V. Smirnov	Member, Secretariat CC CPSU; Chairman, Military-Industrial Commission of Council of Ministers USSR
I. D. Serbin	Candidate Member, CC CPSU; Chief, Defense Industry Department, CC CPSU
S. A. Zverev	Minister of Defense Industry
V. F. Bakhirev	Minister of Machinebuilding
S. A. Afanasyev	Minister of General Machinebuilding
V. F. Zhigalin	Minister of Heavy, Power, and Transport Machinebuilding
V. D. Lebedev	First Deputy Chairman, GOSPLAN
G. A. Titov	First Deputy Chairman, GOSPLAN
A. P. Lyashko	Full Member, CC CPSU; Chairman, President of Supreme Soviet, Ukraine
I. S. Grushetskiy	Full Member, CC CPSU; Chairman, Party Commission, Central Committee, Ukraine
I. K. Lutak	Full Member, CC CPSU; Second Secretary, CC CP Ukraine
A. A. Titarenko	Full Member, CC CPSU; Secretary, CC CP Ukraine
G. I. Vashchenko	Full Member, CC CPSU; First Secretary, Kharkov Obkom
Ya. P. Pogrebnyak	Candidate Member, CC CPSU; Secretary, CC CP Ukraine
I. Z. Sokolov	—
V. G. Kulikov	First Deputy Minister of Defense; Chief of General Staff
I. I. Yakubovskiy	First Deputy Minister of Defense; Commander in Chief, Joint Armed Forces of Warsaw Pact
I. G. Pavlovskiy	Deputy Minister of Defense; Commander in Chief, Ground Forces
N. N. Alekseyev	Deputy Minister of Defense
A. A. Yepishev	Chief, Main Political Directorate, Soviet Army and Navy
A. Kh. Babadzhanyan	Chief of Armored Troops, Ground Forces
P. V. Finogenov	Deputy Minister of Defense Industry
L. A. Voronin	Director, Krasnogorsk Mechanical Plant, 1967
V. I. Kurushin	—
O. F. Larchenko	—
N. K. Mordasov	Deputy Minister of Defense Industry
L. S. Mochalin	—
P. N. Rudakov	—
V. P. Finogenov	—
V. Ya. Nezhlukto	Leningrad Kirov Plant, 1965
A. P. Bezdetko	Kharkov Oblast Executive Committee
I. I. Sakhnyuk	Kharkov Engine Plant
N. S. Lychagin	—
G. I. Lashenko	—
L. S. Saunina	—

Second, by identifying the positions of the signers and analyzing the composition of the group we often can uncover clues about the nature of the work of the deceased and his facility, and the extent of its involvement with other facilities or industries.

Clues in the Lists of Signatories

As the analysis of the Soich and Kosberg obituaries suggests, the lists of signers often contain unmined nuggets of information—clues to personality and facility relationships and keys to the analysis of other intelligence sources. The clues, however, must be found with a minimum investment of time and energy. A list of signers often contains more than 50 names, only a few of which are useful in analysis.

Many of the names, of course, occur on more than one obituary. In general, the higher the rank of the signatory, the more obituaries he signs. The recurrence of some names from obituary to obituary sometimes permits detection of patterns of similarity between two deceased persons. The names that most often provide clues and insights are those that appear on relatively few obituaries, and those of people who have been active in specific fields rather than in general administration.

Fortunately, lists of signers generally follow an order. Knowledge of this "pecking order" can be a great help in identifying individual signatories. Briefly, the order is as follows:

- The names are listed in groups with the highest ranking group first.
- Within the groups, the names appear alphabetically (according to the Cyrillic alphabet).

As Figure 2 shows, on the obituaries of very prominent people, the first signature is Brezhnev's. His name is followed by a group who are full members of the Politburo. The other groups, in order of appearance, are:

- Candidate members of the Politburo
- Members of the Party Secretariat
- Members of the Presidium of the Council of Ministers
- Chiefs of Departments of the Central Committee
- Ministers and/or military leaders.

On the obituaries of Academicians, the signature of the President of the Soviet Academy of Sciences precedes the signature from the Presidium of the Council of Ministers; on others, his signature follows those of the heads of departments of the Central Committee.

The obituaries of some less prominent people may be signed by few, if any, of the officials above the rank of minister. For example, if the deceased had been a deputy minister of one of the defense-industrial ministries, the only very high-level signers may be D. F. Ustinov, L. V. Smirnov, and I. D. Serbin. The other signers may all be ministers, deputy ministers, and heads of main administrations. In the case of Soich, the signatories at the end appeared to be other plant directors.

The signatures on these obituaries also appear in groups, but they are not always arranged alphabetically within the groups. The fact that the names are clustered, however, sometimes reveals intelligence that is not available from other sources. In

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1975, the obituaries of two deputy ministers of the Ministry of Machinebuilding provided excellent new intelligence.

Before the death of V. F. Semenov in January, 1975, Minister Bakhirev and Deputy Minister D. Medvedev were the only officials of the Ministry of Machinebuilding who had been revealed since its formation in 1968. According to the obituary, Semenov had been appointed to the deputy minister position in 1968; he had occupied this important position for more than six years without being identified. The list of signers is given in Table II.

The signatures on Semenov's obituary appeared in groups which were in rank order. In fact, even the distinction between deputy minister and first minister was maintained in the grouping. In the group of ministers, Semenov's superior, Bakhirev, was listed first, followed by Zverev, from whose ministry the Ministry of Machinebuilding (MM) had been formed in 1968.

Since the signatures are clustered, and since the last group includes a known deputy minister, the signatories in the last group probably are all deputy ministers. It seems likely that all are deputy ministers of MM.

As of the beginning of 1975, the technical field and product responsibilities of the Ministry of Machinebuilding had not been disclosed. Some analysts had speculated, on the basis of historical patterns, that it was responsible for munitions. Munitions work had been placed under the Ministry of Defense Industry circa 1950. In 1953 a Ministry of General Machinebuilding was established to handle munitions. This ministry disappeared in 1957 when the State Committees were formed, and munitions work once again became part of the defense industry administration (GKOT, later MOP). The formation of MM in 1968 elements of MOP was just one more administrative change for munitions, the analysts reasoned.

The listing of probable deputy ministers in Semenov's obituary presented analysts with an opportunity to obtain indirect evidence about MM's role. Research uncovered some information about the World War II activities of V. F. Semenov and two of the signatories in the group. In 1942 Semenov was a Shop Chief at Plant 637 of the

Table II

Identification of Signatories of the Obituary of V. F. Semenov

D. F. Ustinov	Candidate Member, Politburo, CPSU
N. K. Baybakov	Member, Presidium of Council of Ministers; Chairman of GOSPLAN
V. N. Novikov	Member, Presidium of Council of Ministers; Chairman of Presidium Commission for Foreign Economic Questions
L. V. Smirnov	Member, Presidium of Council of Ministers; Chairman of Military Industrial Commission
I. D. Serbin	Chief, Defense Industry Department, CC CPSU
V. V. Bakhirev	Minister, Ministry of Machinebuilding (MM)
S. A. Zverev	Minister of Defense Industry
S. A. Afanasyev	Minister of General Machinebuilding
P. V. Dementyev	Minister of Aviation Industry
G. A. Titov	First Deputy Chairman, GOSPLAN
N. A. Bogdanov	First Deputy Minister, MM
G. N. Abaimov	—
N. S. Zakharov	—
D. P. Medvedev	Deputy Minister, MM (1968)
V. N. Rayevskiy	—
P. G. Fateyev	—

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People's Commissariat for Munitions, and Rayevskiy had been Military Chairman of an artillery range of the munitions commissariat. Medvedev held an administrative position at Plant 65 of that commissariat in 1945. Since the deceased and at least two of the signers in the deputy minister group are former associates of munitions plants, the analysts' assessment of MM's function appears to be confirmed.

In December 1975, N. I. Shishov, another of the MM Deputy Ministers, died. Like Semenov, he had been a deputy minister since 1968, but had not been identified as such. His list of obituary signatures was almost identical to Semenov's, but it also included the Ministers of Radio Industry and Electronics Industry.

One signature that was difficult to explain on both obituaries was that of N. A. Bogdanov. Bogdanov has since died, and his obituary confirmed that he was First Deputy Minister of MM. At the time that the Semenov and Shishov obituaries appeared, however, the available collateral intelligence indicated that Nikolay A. Bogdanov was First Deputy Minister of Radio Industry. The question was complicated by the fact that other information identified a Nikifor A. Bogdanov who was a fitter at a munitions plant during World War II. There was no apparent reason why someone from the radio industry would sign the Semenov obituary, nor was it clear why Bogdanov's name was located where it was. What position could he have that would outrank a deputy minister yet be lower than a minister? Could it be that his name was so placed because he represented an organization other than MM, just as Titov did? These questions could not be satisfactorily resolved on the basis of the information at hand at the time of Semenov's death.

Nor was the confusion resloved when the Minister of Radio Industry signed Shishov's obituary. This simply eliminated the objection to Nikolay Bogdanov because of his radio industry position. Research on another obituary, however, could have resolved the matter.

When V. D. Kalmykov, predecessor of P. S. Pleshakov as Minister of Radio Industry, died in March 1974, several of his known deputy ministers were signatories. Notably absent from the list was Bogdanov. If Bogdanov had still been the First Deputy Minister, he almost certainly would have been a signer. The fact that he did not sign for Kalmykov, but did sign for Semenov and Shishov could be interpreted as an indication that he had moved. Had we reasoned further that as First Deputy Minister his name would precede those of the Deputy Ministers, we would have understood that he was signing as First Deputy Minister of MM. Again, rank determined the order of the signatures.

Obituaries as Sources of Intelligence

The Kosberg obituary revealed the existence of an important design organization. It also provided us with a list of personalities to watch for further information about that organization and its activities. Ultimately we were able to identify one of these personalities as Kosberg's successor.

It is not often that an obituary identifies a previously unknown organization or indicates who is likely to succeed the deceased, but since the Kosberg obituary there have been others. One was the 1971 obituary of G. N. Babakin which both identified him for the first time as a designer and revealed the existence of his design bureau for automatic space vehicles. Another was the obituary of the well-known missile designer M. K. Yangel, which was signed by V. F. Utkin. On the basis of his signature and the subject content of three Soviet author certificates of invention, we surmised correctly that Utkin would succeed Yangel. From still another signed obituary we guessed that

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R. A. Belyakov would succeed the famous aircraft designer A. I. Mikoyan. Belyakov was the only one of the deputy chief designers to sign Mikoyan's obituary.

From the Semenov and Shishov obituaries we were able to assess the responsibilities of the Ministry of Machinebuilding, and in the Soich obituary we obtained clues that the "Kharkov Tank Plant" referred to in many intelligence reports is really the Kharkov Transport Machinebuilding Plant. We had suspected these facts before, but in the case of the Ministry of Machinebuilding we had no evidence, and in the case of the tank plant, the available reports simply were sparse and contained much confusion about the precise identification and location of the plant. The Soich obituary provided evidence that helped us resolve that confusion.

The Semenov and Kalmykov obituaries illustrate another way in which signed obituaries provide valuable intelligence: because there are protocols for who signs and for the order of the signatures, obituaries sometimes reveal information about the *signatories*. Just as we identified probable deputy ministers in Semenov's obituary, we could have identified Pleshakov as the First Deputy Minister of Radio Industry and the logical candidate to succeed Kalmykov.

When well-known Soviet R&D administrators are reassigned, their new positions and functions often remain obscure for several years. This is the case with V. M. Myasishchev, the chief designer of the Mya-4 BISON bomber. In 1960 Myasishchev was appointed chief of the Central Aerohydrodynamics Institute (TsAGI). He was replaced by G. P. Svishchev in 1966. Since then his position and responsibilities have remained concealed. There simply is no information. In the last few years, however, Myasishchev has signed several obituaries, including that of S. V. Ilyushin (Figure 1). In each case, his name has appeared at the end of the list of aircraft chief designers and before the list of aviation engine chief designers. The chief designers' names have generally been in alphabetical order. If Myasishchev had returned to designing bombers we could expect to find his name alphabetically in position among the chief designers, but it is not there. Therefore, although the obituaries do not tell us exactly what Myasishchev is doing, it is evident from them that he is active as a chief designer and probably is working on some kind of aerodynamic vehicle or aerospace equipment that is significantly different from conventional aircraft.

As the foregoing examples illustrate, signed Soviet obituaries are sources of information that can contribute to our assessments of the capabilities of the USSR military product R&D system by helping to identify the roles and responsibilities of R&D organizations and key personalities that comprise the system. The relevant obituaries now on file should be analyzed to reveal whatever unmined nuggets of intelligence they may contain.

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Problems in verifying
Soviet arms expenditures

INTELLIGENCE MONITORING OF REDUCTION-OF-BUDGET ARMS CONTROL AGREEMENTS

Robert E. Leggett

I. INTRODUCTION

Renewed interest of U.S. policy makers in Reduction of Military Budget (ROB) arms control agreements presents the possibility of challenging collection and analysis problems for the intelligence community.

ROB agreements control force levels of the signatories by restricting national defense expenditures rather than by explicitly limiting numbers of military weapons and forces. If the United States were to enter into such an agreement, the intelligence community would be required to collect and analyze an increasing amount of financial and economic data in addition to the traditional military order-of-battle information. The purpose of this paper is to examine some of the problems the community would face in monitoring such an agreement. The discussion will be limited to an analysis of an ROB agreement between the United States and the USSR, although the principles discussed are applicable to all nations.

Since World War II, ROB arms control proposals have been presented by such disparate advocates as Secretary of State Cyrus Vance and Soviet Communist Party Secretary Leonid Brezhnev. The proposals have ranged from simple percentage cuts in defense budgets to more complicated time-phasing arrangements. Advocates of the ROB approach maintain that it would provide a simple and easily implemented means of arms control. They also argue that budget limitations would control military activities which are hard to monitor, such as Research, Development, Testing and Evaluation (RDT&E), while still allowing the nations involved flexibility in determining the mix of weapons that best meets their needs within the limits of the agreement. Additionally, such an agreement would avoid the so-called "balloon effect" in which a signatory nation could compensate for reductions or controls on one weapon system by spending greater amounts on alternative systems or by striving for extensive qualitative improvements.

Critics point out that while ROB proposals appear on the surface to be simple and straightforward, they actually portend a host of verification problems for the intelligence community, not the least of which is Soviet secrecy in regard to its defense budget. They maintain that the definitional problems of what constitutes "defense" activities, differences in U.S. and Soviet price systems, and the opportunities to hide military expenditures in other budgets make ROB agreements unworkable.

Whatever the merits or drawbacks of ROB arms control agreements, the continued interest in them by U.S. policy makers requires the intelligence community to be aware of the collection and analytical problems involved and to be ready to develop and implement a suitable verification mechanism.

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II. CHRONOLOGY OF R.O.B. PROPOSALS

Proposals to limit military expenditures through budgetary controls extend as far back as the turn of the century. In 1899 at the Hague Peace Conference, for example, Russia proposed ceilings on army and navy expenditures in hope of preventing an arms race. The League of Nations also studied the method of budgetary control in some depth over the years 1923-1934.

Since the end of World War II, ROB proposals have been put forth by various nations, on numerous occasions, and in different forums. The Soviet Union has been particularly active in promoting such initiatives, having made more than 20 such proposals since 1948.[1] One of them, submitted at the 13th session of the UN General Assembly, called for the United States, the USSR, Britain, and France to reduce their military expenditure by 10 to 15 percent to provide assistance to underdeveloped countries. Another Soviet proposal put forth in 1973 called for a ten percent reduction in the military budgets of the permanent members of the UN Security Council and called for ten percent of these savings to be used to assist developing nations.

Western nations have also on various occasions proposed limiting defense budgets. The United Kingdom suggested freezing military expenditures in 1954, and the French put forth a similar suggestion in 1955. In 1960 a group of Western nations proposed to a Ten-Nation Disarmament Committee the establishment of an International Disarmament Organization to collect and monitor budgetary information on defense spending. A Draft Treaty for General and Complete Disarmament by means of budgetary control was also presented by the United States in 1962.[2]

Controlling the world's arms race was the subject of a recent report written by a private study panel commissioned by the United Nations Association of the United States of America. Significantly, the vice-chairman of this prestigious panel was Cyrus Vance, now Secretary of State in the Carter Administration. The recommendations of the panel were published in 1976 in a book entitled *Controlling the Conventional Arms Race*. Among the recommendations advanced by this group were the following:

—As a prelude to mutual reductions, the U.S. should seek a negotiated mutual freeze on defense spending and conventional force levels.

—The U.S. should actively explore the idea of a one-year reduction of five to ten percent in military expenditures by the U.S. and the Soviet Union through "mutual example."

—The U.S. should examine the possible forms of a standardized military budget and the possibility of UN members reporting their military budgets in the standardized form.[3]

The 1973 proposal put forth by the Soviet government, calling for a ten percent reduction in the military budgets of the permanent members of the UN Security Council, was formally adopted by the United Nations as General Assembly Resolution

[1] Becker, A. S. and Ysander Bengt-Christer, *International Limitation of Military Expenditure: Issues and Problems* (Rand Corporation, R-1911-ACDA, April 1976), p. 1.

[2] For an in-depth discussion of budget limitation proposals Hallkjell O. Jensen, *Budgetary Control and the Limitation of Armaments* (Norwegian Defense Research Establishment, NOTAT S-76, Norway), pp. 5-12 and Becker, Abraham S., *Soviet Proposals for International Reduction of Military Budgets* (The Rand Corporation, March 1977).

[3] United Nations Association of the United States of America, *Controlling the Conventional Arms Race* (Sanders Printing, New York, 1976) p. 25.

3093A.[4] A group of 11 consultant experts was subsequently appointed by Secretary-General Kurt Waldheim, including representatives from both the United States and the USSR, to study the question of budget reductions and to prepare a report for the General Assembly.[5]

Member nation reaction to the report of the Experts Group was generally split along ideological lines. Most free world nations felt that the report was "a useful document which effectively draws attention to the complex and difficult issues involved." [6] They were, however, skeptical that such agreements were workable under existing circumstances. The position of the U.S. was representative of most free world nations:

> The United States is prepared to engage in serious efforts to resolve the conceptual and technical problems involved in achieving effective agreements on military expenditure limitations. . . . At the present stage, however, in the absence of solutions to fundamental conceptual problems, it would be premature to consider the levels of possible reductions in military expenditures and the disposition of funds thus saved.[7]

Soviet Bloc nations, however, were generally critical of the report, claiming it was a device to delay the implementation of the original resolution proposed by the Soviet Union. For example, Czechoslovakia responded as follows:

> the General Assembly . . . has to exert efforts . . . aimed at implementing Resolution 3093A and it should not deal with complex studies of technical issues not connected with the implementation of the provisions of the resolution.[8]

The reaction of the Soviet Union was also negative.

> . . . [the Experts Group report] does not contribute to the practical solution of the question of reducing military budgets, because in essence it departs from the implementation of the specific measures deriving from Resolution 3093A on this question proposed by the Soviet Union.[9]

Thus, despite the fact that the USSR had participated in the Expert Group and that their representative had endorsed its report, the Soviet government backed off from further support of technical discussions leading to the implementation of their proposals.

The developing nations generally acknowledged the complexity of the issues raised in the report and were somewhat skeptical that such an agreement could ever be put into effect. They did, however, agree with the need for saved funds to be used for international assistance to developing countries. Mexico, for example, suggested that 50 percent of the released funds be used for international assistance.

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[4] Resolution 3093A was titled *Reduction of Military Budgets by States Permanent Members of the Security Council by 10 percent and Utilization of Funds thus Saved to Provide Assistance to Developing Countries.*

[5] See Report of the Secretary General, same title as Resolution 3093A (United Nations A/9770/Rev. 1, New York, 1975).

[6] United Nations General Assembly, *Implementation of General Assembly Resolution 3254 (XXIX) A/10165* dated 1 August 1975, p. 4.

[7] *Ibid.*, p. 9.

[8] *Ibid.*, p. 48.

[9] *Ibid.*, p. 53.

A second Experts Group was appointed by the UN Secretary-General in January 1976 to provide an in-depth analysis and examination of four specific issues relating to budget-reduction proposals: (1) the definition and scope of the military sector and of military expenditures, as well as the classification and structuring of expenditures within military budgets; (2) the valuation of resources in the military sector; (3) the deflation of military expenditures to account for differences in the rate of price change in various countries; and, (4) international value comparison and exchange rates.

Their report [10] deals with the more practical issues of putting budget limitation agreements into effect and is a step forward from the theoretical and conceptual issues addressed in the 1974 Experts Group report. The complexities of the subject, however, are such that not all the elements of a complete solution to the implementation of an expenditure limitation agreement were provided. Moreover, the technical issues of verification still remain to be solved. In addition, there is still the need for further translation of the concepts set forth in the study into workable practicalities which are agreeable to both the U.S. and the USSR.

III. THE SUBSTANTIVE ISSUES

There remain problems of definition, measurement, economic realities such as inflation, and verification which will first beset the diplomats who try to negotiate an effective and acceptable treaty, and then remain with the intelligence agencies attempting to monitor compliance.

Definitional Problems

The initial step in formulating a meaningful budget limitation proposal is a clear and concise definition of the activities which are to be considered military in nature. Once this is accomplished, a monetary value can be assigned to these activities which then can be used as a basis for international comparison and negotiation.

The military budgets of the United States and the Soviet Union, however, are not directly comparable because of various activities which are included or excluded from each, depending upon the organizational peculiarities of each country. For example, the Soviet Union has a large paramilitary force of border guards, construction troops, transportation troops, and internal security troops (MVD) which have no counterpart in the United States. A similar example on the U.S. side is the Coast Guard. Moreover, the delimitation of the military sector is further complicated by such other activities as civil defense, military aid, and commodity stockpiling.

Finally, there is also the problem of the interaction of the military and civilian sectors of the Soviet and the U.S. economies. In some instances, military activities benefit the civilian sector, while in other instances civilian expenditures provide spillover benefits to the military sector. For example, in the U.S. the Corps of Engineers and the Hydrographic Office provide services to the civilian sector. Likewise, civilian highway construction and subsidies to the maritime shipbuilding industry are examples of civilian activities which support the military. There are also activities in the Soviet Union which provide spillover benefits to the military or civilian sectors—e.g., military construction and grain harvest activities.

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[10] United Nations General Assembly, *Measurement and International Reporting of Military Expenditures: Report Prepared by the Group of Experts on the Reduction of Military Budgets, A/31/222* dated 20 October 1976.

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The second UN Experts Group dealt at length and in some detail with the definitional question. In so doing, they attempted to provide guidelines whereby the broad definitional issues could be resolved. In addition, individual activities were addressed and in some cases judgments made as to whether or not these programs should be included in the military sector. They also proposed a framework for standardized international accounting and reporting of military expenditures.[11]

Measurement

Bilateral comparison of the value of the military expenditures of the United States vis-a-vis those of the Soviet Union is especially difficult because the economic systems are radically different and because neither country's economic system works exactly as it is theoretically supposed to. In the U.S. capitalistic system, ideally, prices are determined in competitive markets. In theory, these prices together with profit incentives result in maximum productive efficiency, optimum resource allocation, and prices which reflect relative scarcities. In the Soviet Union's socialist system, on the other hand, ideally, all prices and resources are administratively planned by central authorities.

In reality, neither system operates in its ideal form. For example, in the United States, prices are not always determined in competitive markets. Rather, U.S. firms often have some measure of control over prices, and unions have some ability to push up wages. Moreover, inadequacies in the market system often necessitate government regulations and sometimes even price controls.

Prices in the Soviet Union are also determined in a variety of ways. Industrial wholesale prices are centrally planned on the basis of production costs plus a profit markup. Retail prices are also set by planning authorities, but in this case a turnover tax is used to clear the market—i.e., adjust prices for demand conditions. Collective farm market prices, however, are not centrally planned but rather determined by supply and demand forces in the market place.

In general, prices in the Soviet Union are far less reflective of resource costs and scarcity than are U.S. prices. In fact, Soviet prices are not intended solely as an instrument for allocating resources. Rather, they serve several other equally important functions such as control of the economy, a measurement tool, and a means of distributing income.[12]

As a result, comparing the value of expenditures of the USSR's military sector on the basis of Soviet ruble prices with counterpart U.S. statistics is questionable, inasmuch as the relationship between Soviet prices and Soviet resources utilized for military purposes is not well understood. Moreover, the Soviet Government with its direct control over prices can arbitrarily vary the values of its military activities. For example, authorities could simply adjust military prices downward as they deem best fits their interests.

Inflation

Inflation in any country means that it takes a larger defense budget over time just to purchase the same mix of military weapons, troops, and other defense activities. It is essential in any military budget limitation agreement to distinguish between such

[11] United Nations General Assembly Report, A/31/222, dated 20 October 1976, p. 32-33.

[12] For discussion of the role of prices in the Soviet Union see Paul R. Gregory and Robert C. Stuart, *Soviet Economic Structure and Performance* (Harper and Row, New York, 1974).

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artificial and real increases in military expenditures. Without such distinctions, differing rates of inflation in the U.S. and the USSR, or a difference in the ability of the two countries to control inflation, could lead to serious inequalities in actual force reductions.

Consumer prices in the U.S. have increased at an average annual rate of about seven percent since 1970, while wholesale prices have risen by almost nine percent annually over the same period.[13] On the other hand prices in the USSR, according to published Soviet statistics, have remained stable over the same period of time. According to these data, for example, wholesale prices of Soviet enterprises in the industrial sector have fallen by about 0.5 percent annually over the same period, while retail prices have remained steady.[14]

Western analysts and some Soviet economists, however, believe that there is a hidden inflation in the USSR despite the published Soviet data and the claims of the Soviet government. They believe the Soviet indexes fail to reflect these price increases either because of faulty statistical methodologies in calculating the indexes, or because true price changes are not captured at all (perhaps by design).[15] Western estimates place the annual rate of price inflation in the USSR at about one to three percent.[16] Soviet economists themselves have occasionally acknowledged a higher rate of inflation than the official statistics indicate.

Because of the economic system in the USSR, the Soviet government also has the ability to repress inflation. This means that prices can be artificially repressed by such means as direct price controls and government subsidies. Evidence that there is a repressed inflation in the Soviet Union includes the large and growing savings accounts of the Soviet population, the long consumer waiting lines, the large subsidies paid to Soviet industries and agriculture, and the existence of black and parallel markets. Therefore, should the differences in inflation rates persist in the future, the USSR would gain an advantage over time in any simple across-the-board limitation on military budgets that did not account for price increases. In other words, a constant Soviet budget would command more military goods relative to a constrained U.S. budget as rising prices erode the purchasing power of the U.S. dollar.[17]

The issue of military price deflators was also addressed in the second Experts Group report to the UN General Assembly. In their report, they set forth specific proposals for the construction of military price deflators and appropriate surrogate indexes for six components of military expenditures: personnel, procurement of

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[13] Calculations are based on price indexes published in the *Economic Report of the President* (U.S. Government Printing Office, Washington, 1977).

[14] *Narodnoye Khozyaistvo SSR,* 1975, p. 232 and p. 645.

[15] For example, there is a large illegal market for goods and services in the economy which functions outside the Soviet institutions and government. Prices in this market are higher than for comparable commodities and services obtained through normal processes. See Dimitri K. Simes, "The Soviet Parallel Market," in *Economic Aspects of Life in the USSR,* (NATO, Directorate of Economic Affairs, Brussels, 1975), pp. 91-99.

[16] See, for example, David H. Howard, "A Note on Hidden Inflation in the Soviet Union," *Soviet Studies, Vol. XXVIII, No. 4,* October 1976, pp. 599-608.

[17] Defense expenditures could be adjusted for inflation by dividing a nation's military budget by a price deflator which measures the rate of price increases in that country. An adjustment for inflation included in an ROB agreement between the United States and the USSR could work to the disadvantage of the Soviet Union. The deflation of the Soviet defense appropriation using Soviet price indexes would result in Moscow being shortchanged, inasmuch as these indexes do not adequately capture actual price increases in the USSR.

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hardware, construction, research and development, imports, and miscellaneous.[18] Not all the conceptual problems were resolved, however, and the report warns, ". . . that (in practice) it will be necessary to take careful account of the wide international variation in the availability and accuracy of price information." [19]

Verification

Probably the most difficult obstacle to the implementation of the budget limitation approach is the problem of verification. This is particularly difficult from the U.S. point of view because of the Soviet Government's policy of strict secrecy about defense matters. In fact, only one official figure on defense expenditures is published annually—the single-line item labeled "Defense" in the Soviet state budget. The USSR, moreover, has never clearly defined what activities are included in the published defense budget.

The magnitudes of the published numbers are, however, clearly too low to procure, operate, and maintain a force the size of the Soviet military establishment, not to mention such other military related activities as RDT&E, civil defense, foreign military aid, and military stockpiling about which the Soviets say nothing. Also, since about 1970 the "defense" numbers have remained constant or have decreased, while Soviet military forces have been growing. For example, the Soviet armed forces are estimated to have grown significantly over the 1970-1976 period while Soviet weapon systems have become more complex and sophisticated. This hardware is not only most costly to procure but also more expensive to operate and maintain. Finally, the inflation believed present in the civilian sector, although slight, has undoubtedly had an impact on the military sector and put some upward pressure on defense costs.

Western analysts have believed for some time that defense expenditures are included in parts of the Soviet State Budget other than the defense line. For example, it is likely that defense expenditures are included in the two unexplained residuals which appear in the budget, and military RDT&E is believed to be financed largely from the "Science" line of the budget. It is also possible that military expenditures are financed from nonbudget sources as well.

Independent Western estimates of USSR defense spending contrast sharply with the Soviet data as shown in Table 1. All of them indicate a level of expenditures two to three times as large as the published Soviet numbers. The Western estimates also show a growth in Soviet defense spending in contrast to the constant or declining trend evident in the Soviet data. The CIA, for example, estimates a four to five percent average annual real growth in Soviet defense spending in the 1970-1975 period.

Verification of Soviet defense expenditures would require more than a single analysis of Moscow's defense budget. General Soviet economic statistics—national income accounts, industrial output data, and input-output tables—would also prove useful in verifying Moscow's compliance with a ROB agreement in that all of these data interlock to some degree. In other words, an understanding of defense in the context of all the Soviet data would increase our confidence in our ability to monitor such an agreement. Unfortunately, the Soviet government is almost as secretive in providing information on its economy as it is in publishing its defense accounts.

A workable verification mechanism requires the facility to collect, process, and analyze a large amount of financial and economic data. This process of necessity

[18] UN General Assembly Report A/31/222 dated 20 October 1976, p. 55.
[19] *Ibid.*, p. 11.

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Table 1

A Comparison of the Official Soviet Defense Budget with Various Western Estimates of Soviet Defense Expenditures

	1970	1971	1972	1973	1974	1975
1. Official Soviet [1] "Defense" Budget						
(Billions of Current Rubles)	17.8	17.9	17.9	17.9	17.6	17.4
2. Lee Estimates [2]						
(Billions of Current Rubles)	42.7-49.1	48.1-55.1	52.3-60.0	59.2-67.7	64.4-73.7	70.8-80.8
(Billions of 1970 Rubles)	42.7-49.1	46.5-53.3	50.8-58.3	56.3-64.5	60.6-69.5	66.5-76.1
3. CIA Estimates [3]						
(Billions of 1970 Rubles)	40-45	42-47	43-48	46-51	48-53	50.55
4. Cohn Estimates [4]						
(Billions of 1970 Rubles)	35.4	37.8-38.4	35.4-36.0	36.4-37.6	37.3-38.7	—

Sources:

[1] *Narodnoye Khozyaistvo SSSR,* 1974, p. 756. for 1975 figure, see *Tsifrax,* 1975, p. 44.

[2] William T. Lee, *The Estimations of Soviet Defense Expenditures, 1955-75* (Praeger Publishers, New York, 1977).

[3] *Estimated Soviet Defense Spending in Rubles, 1970-1975,* Central Intelligence Agency, SR 76-10121 (Unclassified).

[4] Stanley H. Cohn, *A Re-Evaluation of Soviet Defense Expenditure Estimates* (Submission to the Stanford Research Institute, June 1976), p. 17.

would require intrusion into areas to which foreigners have never had access, and would involve the exchange (or acquisition by other means) of classified information and state secrets. The verification mechanism would also require an auditing process whereby any attempt to circumvent the agreement would be detected. Circumvention could occur either within the military sector—e.g., artificial reduction of military transaction prices, budget subsidies, and the like—or by manipulations outside the military sector—e.g., allocating some military expenditures to nonmilitary agencies, concealment of military production under civilian labels, and so forth.[20]

Independent examination of Soviet force levels and military activities by national means could be used to verify Soviet compliance with an ROB agreement. Because such agreements are stated in terms of military budgets, however, a single, aggregate, nominal value still has to be assigned to the Soviet forces and activities observed. We do not believe that any such measurement we can produce is accurate enough in the short run to provide an independent monitoring mechanism. Moreover, it is unlikely that in the future we can improve upon the accuracy of this method sufficiently—e.g., by adding more analytical resources to this effort and by more careful direction of present resources—to rely upon it as an independent ROB verification mechanism. At best, flagrant violations probably could be detected within several years by this method, but the Soviet government still could hide substantial infringements for even longer periods of time. Furthermore, it is also unlikely that the Soviets would agree to any provisions written into an agreement which would adequately improve our independent ability to measure the value of Soviet defense expenditures more accurately.

Needless to say, the verification problem is the key to the defense expenditure limitation approach to arms control. The Soviet government so far has shown no inclination to reverse its policy of strict secrecy in defense matters. Until the Russians become more open in this area, efforts to resolve the definitional and measurement problems will make little difference.

[20] Becker and Bengt-Christer, *op. cit.,* p. 70.

INTELLIGENCE IN RECENT PUBLIC LITERATURE

CIA'S SECRET OPERATIONS: ESPIONAGE, COUNTERESPIONAGE, AND COVERT ACTION. By *Harry Rositzke* (Reader's Digest Press, New York, 1977).

Harry Rositzke's book is the first attempt by any non-disaffected insider to tell the broader story of CIA's secret operations. The need for an unbiased public account that would put the record in some perspective has been obvious since the intense press play and investigations of 1975-76, but although the author has made a contribution to better public knowledge of the clandestine service, his book unfortunately provides its own distortions of the record.

The difficulty may begin with the problem of finding source material on secret operations. I know Rositzke got little if any response to his pleas that parts of the operational record be declassified for an authoritative accounting in his book. The fear was that the Agency would appear to be playing favorites if it helped a "friendly" writer like Rositzke. In the absence of such official help, he was forced to fall back on his own experience for material, on open sources, and perhaps on the recollections of retired operations officers. These source limitations contribute to problems of focus and distortion.

As the author notes, the book is not a history and—although based mainly on his personal experience—neither is it a reminiscence. Its focus is somewhere in between. As a result, it lacks for the most part both the immediacy and human interest of personal recollection and the authority of fully researched and sourced history. One is asked to take a lot on faith when the author's direct experience with events he is recounting is less than obvious and he provides no sources to support his material.

More crippling, when so much of the sourcing is personal recollection, is the narrowness of Rositzke's experience. Aside from a tour as Chief of Station in India, his whole professional life concentrated on espionage and counterespionage operations against the Soviets and East Europeans and against Communist parties around the world. This inevitably distorts his perception of the shape and nature of the clandestine operational experience. Officers in these areas of operational activity have historically been the least involved with the rest of the government in the day-to-day handling of crises around the world. He covers operations in Asia and the Middle East, for instance, in a very cursory way, and yet these have been very active, policy-involved, operational areas, generating pressures which have been instrumental in molding the Operations Directorate and fixing, for better or for worse, its size and place in the government. Rositzke's lack of experience in the "hot" areas during the tumultuous 1950s and 1960s is a distinct drawback in his ability to present a balanced picture of the clandestine service.

Apart from these source-related difficulties, the author's sense of security discretion leads, unfortunately, to another drawback with the book—a curiously bloodless description of events which should be full of life, personalities, and emotion. He names no true names of agents or operations officers; in fact, he avoids almost all mention of CIA personalities—even those publicly known. His description of specific operational activity is sterilized. Praiseworthy as this is, it tends to populate an intensely human business with cardboard figures, which may illustrate nothing more than the difficulty of writing convincingly about secret operations within appropriate security restrictions.

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To my mind the most useful part of the book details early airdrops of agents into the Soviet Union to collect early-warning information, cross-border operations into the European satellites, legal traveler operations into the USSR, clandestine procurement of Soviet military hardware, recruitment attempts against Soviet and satellite intelligence officers, and operations against local Communist parties around the world. These are operations with which Rositzke is personally familiar. He buttresses his account with numerous case histories, and it has a ring of authenticity.

At the same time, he complains bitterly that the U.S. military in the early 1950s pushed CIA into unproductive airdrop and cross-border operations in a panicky conviction that the Soviets were going to attack in Western Europe. He believes that instead of collecting tactical military intelligence, the operational effort should have been channelled into collection of "strategic" intelligence. This sort of argument appears in different form throughout the book. If only the pressures of recurrent crises had been resisted, he believes the clandestine service could have continued as a small, truly secret organization concentrating on the collection of only the highest priority intelligence, the most sophisticated counterespionage, and a minimum of high-level covert action.

As attractive as this argument is to those of us who grew up in the espionage tradition, I think it is largely pipe dreaming. The clandestine service, to survive, had to do what the policy makers wanted at any given time, and it still has to. In the late 1940s and early 1950s, not everyone saw as clearly as Rositzke says he did that the Soviets were not going to launch an attack in Europe. It may have been better at the time to attempt to develop an early warning capability than to wait for years for a successful penetration of the Soviet General Staff. Given the low level of professional expertise then available, as the author illustrates in his descriptions of early recruitment attempts against Soviet officials, it is not surprising that the management of the time bowed to military pressure for early warning intelligence.

Ensuing sections of the book, which give a more generalized description of the three main elements of secret operations—espionage, counterespionage and covert action—are liberally sprinkled with debatable opinions. To cover but three:

1) As a result of pressure from insatiable analysts, Washington is drowning in reports from "journalistic" espionage. The remedy is to concentrate on strategic information that can be of real help to policy makers on vital decisions. *Comment:* Rositzke is out of date. A determined effort has been made in recent years to limit intelligence requirements for clandestine collection. Also the contribution of clandestine reporting to finished intelligence is far higher than he implies.

2) It was unnecessary and self-destructive for the CIA to become involved in large-scale propaganda operations like support for the National Student Association and Radio Free Europe. *Comment:* To suggest that some other organization of the U.S. Government could have overtly organized and funded these operations at the start is totally unrealistic. The fault lay in carrying on these effective operations too long, not in starting them in the first place.

3) Paramilitary operations are noisy, cannot be plausibly denied and the history of their use is one of almost uniform failure. The function should be turned over to the Department of Defense. *Comment:* One can argue whether Guatamala, the Congo, and Laos were failures, but again Rositzke is out of date. The Agency today maintains a very modest paramilitary capability. Most PM officers still on board have been retained in other professional disciplines and are working at them. Given the military's aversion to unconventional military action and the rigidities of their computerized

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supply system, probably the only real choice is to leave the function with CIA or eliminate it entirely as a U.S. capability.

Toward the end of the book Rositzke conducts a spirited and admirable defense of the Agency in discussing the investigations of 1975-76, but opines that the anti-CIA campaign drastically reduced CIA's ability to recruit and retain the best agents. This might seem a logical result, but it simply was not so as of the last date I can vouch for, May, 1976.

Rositzke introduces his concluding chapter on the future of secret operations with a somewhat irrelevant argument to the effect that the U.S. policy of attempting to contain the Soviet Union has been a losing exercise because we have seen the struggle in primarily military terms whereas the Russians have understood that economic and political forces could be harnessed to support their interests. I don't believe he makes a convincing argument, but he does reveal that to him the world is still bipolar: the Russians and us. He almost seems to imply that as long as the Russians haven't been squeezed back into their pre-World War II territorial and power position, they must be winning. Is this another manifestation of the ten-foot-Russian syndrome that afflicts so many who have spent the better part of their life clandestinely battling the Soviets? Whatever it may be, it adds little to a book about the clandestine service.

The book concludes with three recommendations which reflect the bias of Rositzke's experience:

1) Leave the present Operations Directorate functioning abroad on a reduced scale to maintain liaison with local services, provide confidential communications between governments, and support other elements of the intelligence community. Establish—separate from the federal bureaucracy—a small American secret service under non-official cover, concentrating exclusively on strategic intelligence targets.

2) Strengthen counterintelligence by putting the right men into this work against the "brilliant, patient and careful case officers" of the KGB. Put cooperation between the FBI and the CIA on a clear footing.

3) Eliminate large-scale paramilitary and propaganda covert action and concentrate on scaled-down covert political action which should be employed only in situations of critical importance.

He has a dream which emerges in his recommendation for a separate, truly secret intelligence service: "There would be no pressures for current production, no wholesale reporting requirements, no leaks to analysts, journalists, or Soviet officials, no bureaucracy to hold up recruitment, no vast intelligence community to serve." And probably, one suspects, after a period of time, no money for operations or case officers.

Rositzke is right on a good many points. He rightly emphasizes the importance of agents of influence in covert action. He misunderstands recent moves in the counterintelligence staff and current FBI relations. He is at heart something of an intelligence romantic, and he has written a book about the clandestine service that reflects that romanticism. He has provided the general public with much useful material along with a fair measure of dubious theory. The missing dimension in his book is how the clandestine service has been shaped by the real world of governmental action, politics, and personalities, and will continue to be so in the future.

William E. Nelson

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SECRETS, SPIES AND SCHOLARS, BLUEPRINT OF THE ESSENTIAL CIA. By *Ray S. Cline* (Acropolis Books Ltd., Washington, 1976).

Even with its flaws, *Secrets, Spies and Scholars* is an outstanding contribution to the public literature on the field of intelligence. It should help the general public better understand how the Central Intelligence Agency developed, and the problems it has encountered and still faces today. It should help remind the intelligence community of some of the basic truths that have been derived from experience. It should help raise the level of public debate which has too frequently been ill-informed and even hysterical. It is the only recent book by an informed author to deal with the production end of intelligence.

Dr. Cline's credentials to write this kind of book are unique. He first entered government service in 1942 doing cryptanalysis work for the Navy, but soon switched to the newly created Office of Strategic Services. After World War II he spent four years in the War Department writing the official history of General Marshall's "Command Post." Then he took an analytical post in the newly created CIA, eventually rising through the ranks to be the Deputy Director of Intelligence. Cline's experience is overwhelmingly that of the bureaucratic "scholar" rather than that of the "spy"; he is one of the few, however, who has held command positions on both sides of the house by virtue of his service as station chief in Taiwan and in Bonn. Leaving CIA in 1969, he was for four years the Director of the Bureau of Intelligence and Research in the Department of State. He resigned in November 1973 and took up his current position as Director of Studies at the Georgetown University Center for Strategic and International Studies.

His personal participation at increasingly senior levels in the evolution of the central intelligence system enables Cline to combine historical description with personal narrative. The personal element makes this a much more readable book than it otherwise might have been. The organizational shifts in bureaucratic patterns would not make fascinating reading in themselves, but Cline has been able to people the structures with the individuals who left strong personal stamps upon them; personalities such as "Wild Bill" Donovan, Allen Dulles, Walter Bedell Smith, John A. McCone, and many others at different levels.

Over-all, his book makes an excellent case for a centralized intelligence system and for the basic proposition that collection of intelligence must not be undertaken purely for the sake of collection. It must contribute to the base on which objective all-source estimates can be built to serve the top officials of the government in their decision making. In this regard he stresses again and again that there is little reason for having excellent intelligence unless there is access to policy makers who will use the end product.

Cline traces the development of Donovan's OSS and the key role played by the British in its conception and development. He points to the early British promotional role as "a classic example of the best kind of covert action, one that immensely benefited both nations." He covers the interdepartmental bickering—War, Navy, Treasury, State, and FBI—which accompanied the establishment of COI/OSS, including difficulties stemming from J. Edgar Hoover's own overseas ambitions. These

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frictions and jealousies also presided over the dismemberment of OSS at the close of World War II. While some really remarkable men and women joined the OSS on both the analytical and action sides, he is clearly right that it was the derring-do of its espionage and paramilitary adventures that caught the public imagination and which has colored U.S. attitudes toward "intelligence" ever since. Also the "romantic recollection" of these OSS exploits, he feels, was a legacy which in some cases led to disaster in the 1960s and 1970s when paramilitary action was inappropriately applied.

He does well in stressing that the political conditions and attitudes of the 1950s are all too easily forgotten by those making current judgments on CIA activities. USSR-directed Communism was indeed more "monolithic"; European democratic institutions were certainly vulnerable; the Communist coup in Czechoslovakia was a frightening reality; massive organizational effort by Communist "front" groups was clearly on display. As he states: "Beginning with the Berlin Blockade and accelerating with the Korean War, Washington was inclined to expect a direct military assault by the Soviet Union and, later, by Communist China in Asia." CIA estimates later helped to moderate this black-and-white view as conditions changed and stabilized, but that does not alter the realities and perception of that earlier formative period.

He points out that CIA did not seek its covert action role, and that those who set up OPC in 1948 expected it to be small and used only on an occasional basis. Instead it "grew from 302 in 1949 to 2,182 plus 3,142 overseas contract employees in 1952 "—a much too rapid growth but one which was clearly considered justified at the time. OPC was not initially under the control of the Director of CIA, but General Smith soon corrected that as it became clear that clandestine activities, whether of a collection or action nature, needed to be under the same command structure. (General Smith was also not a man who would allow himself to be by-passed.)

Cline provides some excellent historical context and rationale on two other matters of controversy—domestic operations and the Agency's assassination aberration. He most certainly does not attempt a "whitewash" but has provided badly needed perspective. Also, near the end of the book there is a most useful discussion on Congressional oversight.

There are other matters on which this reviewer feels Dr. Cline has done much less well. On one very basic matter, it would seem that having chosen the format of a personal and chronological narrative, he should have seen it through. Instead, he has chosen to say: "There is little to tell about my four years in Germany and my four years in the State Department that adds further light to the story of CIA functions and skills." That is hard to accept. This period included Willi Brandt's coming to power in West Germany and the launching of his Ostpolitik when Cline was in Bonn. It included the Chinese Cultural Revolution, the Greek Officers' coup, the Russian invasion of Czechoslovakia, the Arab-Israeli Wars of 1967 and 1973, the Tet Offensive in Vietnam, the capture of the *Pueblo*, De Gaulle's fall from power, the beginning of the SALT Talks, etc. It also included the 1967 *Ramparts* revelations and their sequels (including the Katzenbach Committee and its guidelines), which devastated the major CIA covert action programs of a political/propaganda nature, and should have been interpreted much more clearly than they were by government leaders as a sea-change in U.S. public opinion toward CIA activity in this field. One result of his desertion of a chronological approach is that he spends the major part of his "Blueprint for the Future" not looking at the future but reviewing the 1974-75 criticisms and commenting on President Ford's and the Congress's "blueprint." His own section entitled "What Still Needs to be Done" covers only eleven pages.

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The new institutional arrangements which have been established and may be developed further may well insure that the Agency responds more swiftly to changes of consensus in this country. Nevertheless, with a secret organization this presents special difficulties, and I wish Dr. Cline had devoted more attention to this problem. I also feel he neglected the whole area of classification, of who decides what constitutes legitimate secrets. In a sense this problem runs throughout the book, and yet I have located only one paragraph (on page 251) that really focuses on it. "Reasonable" men can differ widely in their judgment on this subject. Neither is there enough on the problem of evaluation, of whether or not the intelligence product and action is any good. He cites approvingly Sir Kenneth Strong's pronouncement that what an intelligence officer does is 97% wasted effort but that "our national safety depends on finding the 3 percent." Within a narrow range of endeavor, this may be so, but there are wide areas which need a far, far stricter formula. He is much closer to the mark when he says that "Photographic satellites, signals collection equipment, and even human agents have a specificity and simplicity of purpose and often an operational glamor that wins support from professional budgeteers. Consequently most money goes for collecting information with not enough regard for whether the data are useful or whether analytical staffs are adequate to absorb and use the data."

In his final short section on future recommendations, Cline makes a suggestion which has received a good deal of attention, namely, that CIA should be replaced by CIFAR (Central Institute of Foreign Affairs Research). According to this plan, CIFAR would absorb the top analytical staffs of CIA, State, and Defense. Lower analytical staffs would be attached to State, Defense, etc., but would be composed of CIFAR personnel. "For national research and analysis, the Secretary of Defense and the Secretary of State should rely upon CIFAR." One wonders if Cline was serious. It would appear to be a gross misreading of the power of the respective organizations and counter to his earlier pronouncement that it is not possible to "have too many viewpoints on any estimative problem."

Dr. Cline is rightly concerned that top-notch estimative products must have an audience at the highest level of policy making but, again, his final recommendations do not seem real. His top intelligence officials do not serve the policy makers—they join them. He proposed that the DCI should be given Cabinet rank and that the senior intelligence officials should be used to "persuasively explain the realistic reasons underlying policy to appropriate members of the news media, to the members of Congress, and to the interested public." One suspects access is better provided primarily by having a DCI with the qualities he ascribes to General Smith: "a man with vision and drive, a man with the prestige persuasive to military commanders, ambassadors, and Congressmen, and finally, a man who had the full support of a President who wanted action."

Cline is also never able to really resolve his attitude toward the collaboration between the "spy" and the "scholar," which is so key to the title and the content of his book. On the one hand he is convinced of the value of an "intellectual partnership between scholars and spies" and found his service as station chief in Taiwan to have been "the most stimulating period of my career." On the other hand there are many references to his resentment that the glamor of clandestinity works against analytical evaluation being accorded its due share of appreciation. He deplores the fact that analytical links with academic research people were extremely difficult to arrange because such links were viewed as "somehow a corrupting process." To this reviewer he has it about right in the passage: "Something has to give in an organization which attempts to combine such opposite kinds of activity, and what usually resulted was

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that truly clandestine practices were compromised while perfectly legal scholarly analysis was clothed in an atmosphere of secrecy that was unnecessary, frequently counter-productive, and in the long run damaging to the role of independent and objective evaluation for which CIA was designed." He ends up dissolving the partnership by dissociating the clandestine service from his CIFAR, scattering the clandestine assets about in small units in the federal bureaucracy, allowing only one secret foreign agent operation which would have some potential for covert action, and defining permissible covert action in such a restrictive way that it even excludes operations against the Soviet Union. Yet in the final paragraph of the book he still speaks of spies and scholars as "working in tandem." There certainly does need to be a close link, and there perhaps also should be a separation, but this reviewer does not feel Dr. Cline has found the right formula.

I have been critical of certain facets of this book, but I hope it is clear that I nevertheless feel that Dr. Cline has set forth a great deal that does have the "right formula." I can enthusiastically recommend it. *Secrets, Spies and Scholars* deserves a wide audience.

James E. Knott

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